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MEASURING OVERT AND COVERT RESPONSES IN VIDEOGAME CONTEXT

Dissertation presented to the University of Aveiro with the purpose to fulfill the necessary requirements to obtain the Master's degree in Communication and Multimedia. Done under the scientific supervision of Óscar Mealha, professor at the communication and arts department of the University of Aveiro, and co-oriented by Carsten Möller, senior lecturer at the Institute of Communication and Media Research at German Sport University Cologne.

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Keywords

Video games; Gaming Experience; Overt responses; Covert responses; Measuring techniques; Advertising; Brand placement; Eye tracking;

Abstract

The videogame industry is huge and is in continuous growth. Given this, there is interest in empirical studies that enlighten different concepts in the research field of gaming experience like engagement, immersion, presence, arousal or flow. It is relevant to understand which technology or instruments can be used to identify the desired indicators to access gaming experience in a product testing situation.

The main focus of the work here presented is to compare the gaming experience felt by players with different skill levels with the object of this study – FIFA14. To access the gaming experience of the players I used different instruments like the iGEQ (in-game experience questionnaire), self-assessment manikin scale, eye tracking technology and electro dermal activity. Additionally the effectiveness of an in-game brand placement was tested, with the help of eye tracking technology and a questionnaire.

There was a total of 41 participants in the empirical tests playing FIFA14. They played three skill challenges and one match against a computer controlled opponent. While they were performing this, their gaze behavior, pupil dilation and electro dermal activity were recorded. Additionally they were asked to answer a questionnaire.

The results showed that the method used to form groups based on the skill of the participant was a success. Low skilled participants appeared to experience more arousal than the higher skilled ones. However high skilled participants revealed to have a more positive experience playing FIFA14 than the low skilled ones. Further evidences were not so clear, but still interesting for the theoretical understanding and practical relevance of the named concepts.

Palavras-Chave

Videojogos; Gaming Experience; Overt responses; Covert responses; Técnicas de medição; Publicidade; Inserção de marca; Eye tracking;

Resumo

A industria dos videojogos é enorme e está em constante crescimento. Tendo isto em consideração, existe interesse em estudos empiricos que esclareçam diferentes conceitos no campo de investigação de gaming experience, tais como engagement, imersão, presença, arousal ou flow. É relevante perceber que tecnologias ou instrumentos podem ser utilizados em articulação com os indicadores que permitem avaliar a gaming experience em situações de teste.

O principal foco deste trabalho é comparar a gaming experience de jogadores com diferentes niveis de pericia com o objecto de estudo – FIFA14. Usei variados instrumentos para conseguir aceder à gaming experience dos jogadores, tais como o iGEQ (in-game experience questionnaire), a escala self-assessment manikin, tecnologia eye tracking e medição da actividade electrodermal. Adicionalmente foi testada a eficácia de uma inserção de marca dentro do jogo. Para isto recorri à tecnologia eye tracking e a um questionário.

Foram utilizados 41 participantes no decorrer dos testes empiricos. Foram convidados a jogar três desafios de pericia e uma partida de FIFA14 contra um adversário controlado pelo computador. Durante isto eram recolhidas informações acerca do olhar, dilatação das pupilas e atividade electrodermal. Adicionalmente foram convidados a preencher um questionário.

Os resultados mostram que o método usado para a criação de grupos baseados na pericia do jogador foram um sucesso. Os participantes com menor pericia demonstraram sentir mais arousal que os mais peritos. No entanto, os mais peritos revelaram ter uma melhor experiencia com o objecto de estudo que os com menor pericia. Outras evidências não foram tão claras, mas ainda assim interessantes para uma compreensão teórica e prática da relevância dos conceitos referidos.

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LIST OF ACRONYMS

α – Alpha value;

M – Mean value;

mS – Millisiemens;

N – Total number of elements;

r – Correlation value;

SD – Standard deviation value;

p – Signifier value;

EA – Electronic Arts;

EDA – Electro Dermal Activity;

HEP – Heuristic evaluation of playability;

HCI – Human-Computer Interaction;

iGEQ – in-Game Experience Questionnaire;

PPCR – Pupil Centre Corneal Reflection;

RPG – Role-playing game;

SAM – Self Assessment Manikin;

POV – Point of view;

1. Introduction

1.1. Relevance of the topic

The videogame industry is huge and in continuous growth. This growth is supported by a great range of devices that are not limited to computers and traditional consoles, but extend to an array of mobile devices such as mobile phones or tablets.

Concerning the target public of videogames, it is possible to perceive that it has grown broader. In a European consumer study released in 2012 (Ipsos MediaCT, 2012), 48% of the participants admitted that they went through some kind of gaming activity, while 25% admitted to play at least once a week. The gamer's distribution by gender is also balanced, with 45% of the players being female, which breaks the idea that videogames are mainly played by male gamer's. Adding to this, and breaking the idea that videogames are for younger people, we notice that 49% of the consumers are aged 35 and over[1].

To reach this growing public, designers, script writers and stakeholders of this industry aim to create better and improved products, which may provide a good gaming experience for their target public. To achieve that, they depend that their intended product character is perceived right by the players. In this key process, the player will make his personal interpretation of the intended character according to his personal, cultural and technical background. Adding to this, the emotional and behavioural consequences triggered can also vary depending on the situation were the game is played (Hassenzahl, 2003).

Focusing again on the European consumer study (Ipsos MediaCT, 2012), when players were asked what kind of words they associated most with the gaming activity, the results were not surprising, but still interesting. The word more associated with gaming activity was "Entertainment", followed by "Good at providing escapism", "Fun", "Immersive" and "Competitive". It is clear that people see games both as a leisure or challenging activity.

[1] Source (Last visit: 28 October 2014): http://www.isfe.eu/sites/isfe.eu/files/attachments/euro_summary_-_isfe_consumer_study.pdf

The emotional aspects regarding the players experience with a particular product are complex. It turns out that measuring and interpreting these aspects can be a complicated task, because of the inherent subjectivity present when another person is registering someone's actions, or even the memory loss when the product user tries to remember what he felt in a particular moment. However, as the technology evolved, researchers came up with new methods and strategies to measure the gaming experience, which contemplates concepts like engagement, immersion, flow and presence.

These methods and strategies rely on measuring the player's responses that can be either covert or overt. Overt responses are 'shown openly'[2] while covert responses are 'not displayed or openly acknowledged'[3]. This means that for measuring overt responses we can do direct observation or ask for the player's feedback on the performed activity, but in the covert responses we need to use special tools or instruments to measure them, especially if they are independent of wilful/conscious processes.

These concepts are well defined and characterized. To identify them we need to look for determined indicators and measure them, making possible for the researcher to use the indicators in order to access a concept like gaming experience. Studying the overt and covert responses of the players may also be relevant to improve and optimize the way people act in the game. For example, by analysing their gaze behaviour in a determined situation, it is easy to check whose behaviours were more successful. Adding to this array of possibilities, the overt and covert responses collected from the players may also be useful to know if a brand placement inside the game is being recognized and remembered.

This research's main focus is to find a relation between players gaming skills and their experience in the game. As an added topic, this study will make use of the overt and covert data to observe if it has influence in the performance of the players. This research is part of a master's dissertation project based in the University of Aveiro, in collaboration with the German Sport University Cologne. The object of study is the videogame FIFA14.

[2] Source (Last visit: 28 October 2014): http://www.oxforddictionaries.com/definition/english/overt
[3] Source (Last visit: 28 October 2014): http://www.oxforddictionaries.com/definition/english/covert

1.2. Project aim and goals

The aim of this research work is to make use of the player's overt and covert responses to access their gaming experience with a particular videogame. Further I will investigate if there is a relation between the gaming experience and the skills of the player with the game. To achieve this, it is necessary to undertake a serious literature review, set up the empirical tests and proceed with the analysis. Therefore this research has the following goals:

- Identify which type of overt and covert responses are useful for the research purposes, and identify the technical possibilities and limitations;
- Design, develop and implement a methodology to collect and analyze the desired data;
- Validate and setup the empirical tests, using proper instruments to collect the data.
- Establish relations between the different data collected and use it to access gaming experience.
- Understand if the skill of the players has any influence in the obtained results.
- Understand if overt and covert responses are intercorrelated with in-game performance.
- Understand if the participants recognize and remember a brand placement inside the game.
- Present the results to the academic community and interested stakeholders.

Besides the research goals, I have some personal goals like:

- Improve scientific communication and writing in English.
- Improve human relations and knowledge sharing within an international research group.
- Conceptualize and develop a scientific experience in a real videogame context of use.

1.3. General Research Questions

In a research project it is very important for the researcher to keep a focus on the intended goals. In order to help him, the priority must be to develop and apply a well-defined methodological procedure. It is also necessary to write a clear and objective research question that represents the intended goals of the investigation. When reading it, it must be clear what the researcher is trying to understand or discover with the research. Further, it must be possible to find different answers to it (Campenhoudt & Quivy, 1992). Considering the research problem, I've formulated a main question that is clear about the main goals of this project. The way it is written makes it possible for the reader to identify which are the main concepts at stake and also understand the purpose of the investigation: to see if the gaming skills of a player can influence the gaming experience with a determined videogame.

RQ1: Are gaming skills a moderator for gaming experience?

Having this core research question settled and after looking to the type of data that I needed to collect, I found it pertinent to add two more research questions.

RQ2: Does a penalty kicking strategy influence the gaze behavior and the performance of the player during the penalty kick?

RQ3: Are visual brand placements in digital games an effective way of sponsoring?

In the RQ2, it sounded interesting for me to know if players that claim to have a defined penalty kicking strategy would demonstrate it in their gaze behavior and if it influences their performance. The RQ3 adds a commercial relevance to the research. It seemed relevant for me to access if the players are really noticing the brand placement of the ADIDAS brand in the goal net.

1.4. Structure of the document

This document starts with an introductory part that reveals the relevance of the topic at study and the project aims and goals.

After this, the document is divided in two distinct, but related parts. First there is the literature review, which covers the concepts and aspects that helped me to develop this research, and that also helps the reader to be contextualized with these same concepts and aspects. In the literature review it is possible to get in touch with some of the technologies and instruments that will be later used in the empirical tests.

The second part is the empirical study, which includes the process that lead to the empirical tests and also the results from these tests. By reading this part, the reader will know the research questions that worked as a guideline for the design of the methodology. The methodology that is used is explained, with insights about the object of study, participants and procedure. Concluding this part there are the results of the empirical tests.

The document ends with conclusions, that point out the most relevant findings that occurred during the study.

2. Literature Review

2.1. Gameplay

Games were always present in Human society. There are evidences of games being present in the daily life of people throughout Human history. However we cannot assume that playing is a human characteristic, because animals already played before we even existed. Due to this we are not able to assume that playing is a cultural phenomenon, as culture presupposes human society (Huizinga, 1947).

Play is a fun way to stimulate the mind, body and relationships with others. It is also above any physiological or psychological phenomenon as it transcends physical or biological activity (Huizinga, 1947). A game is not strictly necessary to play. According to Caillois (1961) "play is a parallel, independent activity, opposed to the acts and decisions of ordinary life by special characteristics appropriate to play" (p.62). The "special characteristics" are: i) being free and voluntary; ii) independent from everyday life; iii) uncertain - that is to say that the results are not predictable; iv) unproductive; v) reigned by rules and vi) creates an imaginary world towards "real life".

There are many different perspectives concerning the definition of game. Some of the authors share similar ideas regarding what characterizes a game. The main ideas can be consulted in the table 8 (in the appendix). For the purposes of this investigation I adopted Juul's (2003) definition of game. According to Juul (2003), a game is "a rule-based formal system with a variable and quantifiable outcome, where different outcomes are assigned different values". The 6 points that define a game are then:

- **Fixed Rules** – Games need rules, and they "have to be sufficiently well defined that they can either be programmed on a computer or sufficiently well-defined that you do not have to argue about them every time you play";
- **Variable and quantifiable outcome** – An activity to be considered a game, must present the players with variable outcome, that is "fit the skills of the player". The game also needs to have a clear and objective outcome;

- **Valorization of the outcome** – "This simply means that some of the possible outcomes of the game are better than others" (Juul, 2003). This point is relevant to make the game challenging, as some of the outcomes are harder to get, creating value.
- **Player effort** – The player must be part of the game, and his actions must be related with the outcome. This is part of what makes a game challenging.
- **Attachment of the player to the outcome** – This topic refers to a more psychological feature. The player must relate himself with the outcome, even though his actions are not needed to get the outcome.
- **Negotiable consequences** – The consequences of the game must be accorded by the players, so they are aware of them. This works as a security measure that protects the player from unexpected or harmful consequences.

2.2. Videogames

In a first impression, people perceive videogames as games that are played using a video interface. It is very clear for everyone that videogames are games, inheriting all of the characteristics that a game has, and Frasca (2004) had the same impression when he stated that "even if it sounds obvious, videogames are, before anything else, games"[4]. When people play them they have similar motivations to the one's that play standard games.

To keep it simple, Esposito's (2005) definition of videogame can be used. He affirms that "A videogame is a game which we play thanks to an audiovisual apparatus and that can be based on a story". The audiovisual apparatus that he refers is "(…) an electronic system with computing capabilities, input devices (controllers, mouse, keyboard, etc.), and output devices (screen, loudspeakers, etc.)" [5]. By reading this we can perceive this audiovisual apparatus as a user interface, where videogame designers should be concerned with functionality, usability and satisfaction issues.

Crawford (1997) listed four features that are present in all videogames[6]:

- **Representation** - refers to the capability to simulate an environment where players can act as a fantasy character, be someone else.
- **Interaction** – The videogame allows the players to influence the environment and to do actions, which will keep them engaged looking for achievements and outcomes.
- **Conflict** – There must exist some challenging task or goal that makes it harder for the player to achieve the desired outcome.
- **Safety –** Make it possible for the players to experience real life situations, without the implicit danger and possible damaging consequences.

[4] Source (Last Visit: 28 October 2014): http://www.electronicbookreview.com/thread/firstperson/Boalian
[5] Source (Last Visit: 28 October 2014): http://summit.sfu.ca/item/258
[6] Source (Last Visit: 28 October 2014): http://www.vic20.vaxxine.com/wiki/images/9/96/Art_of_Game_Design.pdf

According to Zubeck, LeBlanck and Hunicke (2004), we can understand how games work through three dimensions:

- **Mechanics** – The mechanics is basically the structure of the game, from a physical point-of-view. It is constituted by the algorithms and rules that allowed the game to be built in the first place.
- **Dynamics** – It is based on mechanics, and it refers to how the game is played.
- **Aesthetics** – It refers to the emotional aspects felt by the player while gaming.

2.2.1. Taxonomy of videogames

We can try to define videogames as a whole, however it is important to characterize and classify games according to their genre. Taxonomy is, according to the dictionary, "The science, laws, or principles of classification"[7], or in other words the practice of classification of things, including the characteristics that support that classification.

Within the game studies, taxonomy is the classification of games in different categories, and this classification is based on their gameplay interaction and challenges. However, and due to technological and conceptual developments, videogame taxonomy turns out to be a bit subjective, and some authors have different perspectives about it.

Lindley (2003) wrote[8] that games could be classified between three different forms of gameplay that are Ludology, Simulation and Narratology. Just as a brief description, and citing Lindley (2003), a "*game is a goal-directed and competitive activity conducted within a framework of agreed rules. This can be referred to as the ludic or ludological definition of game".* He also defines simulation as *"a representation of the function, operation or features of one process or system through the use of another"* (Lindley, 2003). And in a final instance, a narrative is, according to Lindley, *"We can define a narrative as an experience*

[7] Source (Last Visit: 28 October 2014): http://www.thefreedictionary.com/taxonomy
[8] Source (Last Visit: 28 October 2014): http://www.gamasutra.com/view/feature/2796/game_taxonomies_a_high_level_.php

that is structured in time. Different structures then represent different forms of narrative, and a narrative is an experience manifesting a specific narrative structure" (Lindley, 2003).

Games would then be categorized and placed on a triangle shaped form, "*emphasizing the relative degree to which they embody elements of ludic gaming, simulation and narrative*" (Lindley, 2003). To be even more specific, Lindley created other forms of classification, adding to this concept, the gambling element (to include games of probability), the idea of fictional or non-fictional game, and to extend the classification to new forms of interaction, the idea of virtual or physical game.

Like movies, videogames also are categorized by types. To that we call the videogame genre. Oxland (2004), proposed a classification where he divided games in 10 different genres (Sports, Adventure, Action, Simulation, Strategy, Puzzle, RPG, Management, Uncategorized and Online Games). Below we find a list that contains a brief explanation about each of these genres.

Sport Games

Sports games require an opponent, whether it is human or controlled by the computer. The challenge is to win by performance and skill. Sport games have lots of subgenres, including:

- Extreme Sports;
- Action Sports;
- Factual;

Adventure Games

Require that the player use his brain capabilities, in order to advance through challenges. The adventure games often provide an interactive story, where new challenges and achievements are revealed when the player advances. Some of the subgenres of adventure games:

- Action Adventure;
- Survival-Horror;
- Platform Adventure;

Action Games

The main focus of the action games is on the action, that is, challenges that require quick reflexes, skill and timing to overcome obstacles. Some subgenres:

- Fighting;
- Shooters;
- Action-Adventure;

Simulation

Simulation games are known for being very detailed on its objective to simulate a real activity. They target public are mainly enthusiasts of the activity at stake. Simulation games are traditionally used as teaching tools. Subgenres:

- Vehicle simulators;
- Construct simulators;
- Virtual life simulators;

Strategy

Strategy games require an intense brain activity, in order to win. The player must develop a thought process that grants him the strategic advantage over the opponent, whether it is a human or a computerized rival. Subgenres:

- Turn based strategy (TBS);
- Real time strategy (RTS);

Puzzle

Puzzle games display problems that are not easily solved, but always have a solution. The main goal of this type of game is for the player to find the right solution to the problem. This kind of game is often found inside of another games, as a complementary challenge.

Role Playing Game – RPG

RPG's evolved from the MUD's (Multi-User Dungeon) and text-based MMORPG's (Massive Multiplayer Online Role-Playing Games). RPG's go beyond adventure games as they have a more complex design and also include an element of strategy.

RPG's are widely known for granting the player with the opportunity to develop a character and customize it. The way the player develops his character will be fundamental for the game advance. Subgenres:

- War RPG;
- Action RPG;
- Adventure RPG;

Management

Management games are similar to strategy games, but they lack the action element. As the name says, the objective is to manage a situation, in order to make the best out of the player's ability.

Uncategorized

The uncategorized games are the ones that can't fit in a specific genre. The reason for this is that they often possess characteristics that belong to more than one genre.

Online Games

Online games often are derivations of already existing offline games, but with potential massive multiplayer capability and social interaction features. The social interaction factor brought new ideas to the games industry.

2.2.2. Football Videogames

The reason to write this more detailed topic is that in this research I'll test the game FIFA 14. Football is a sport that is a worldwide phenomenon, with millions of fans and practitioners. The game originated in England in late 19th century, and according to the Oxford dictionary as a "*a form of football played by two teams of eleven players with a round ball which may not be handled during play except by the goalkeepers. (…) The objective of the game is to score goals, by kicking or heading the ball into the opponents*'

goal"[9]. Sport videogames became very popular, and many sports have dedicated videogame available in the market. Hence it is not a surprise to see that football has many adaptations and interpretations in the videogame world.

One of the first football games released was 'Pele's Soccer' in 1981, for the Atari 2600. It had poor graphics, but at that time it was considered a fun game, with a good multi and single player action. In 1987, it was launched 'Soccer' for NES console, and although the graphics were a little more appealing, the game had primitive AI and problems in simulating well the soccer game dynamics. 'Sensible World of Soccer' was released in 1994, and it was the first game to allow players to think further than one match at a time. It gave players the possibility of entering leagues, and compete to be a champion. In the same year 'International Superstar Soccer' was released and it provided a big leap in soccer videogames. This game already featured good controls, graphics, a challenging rival AI, among others. This was a fertile year for soccer videogames as two more famous titles were released that year: 'Virtua Striker', which is a famous title in the arcade universe, and 'Actua Soccer' for PC. In 1998, was released FIFA'99 for multiple platforms, a much acclaimed title. Since then Pro Evolution Soccer and FIFA series have been the top acclaimed titles inside the genre.

Figure 1 - FIFA99 graphical interface.

[9] Source (Last Visit: 28 October 2014): http://www.oxforddictionaries.com/definition/english/soccer

2.3. Evaluation and Usability

Nowadays people are making great use of products based on computerized systems for many different reasons and purposes. The array of applications for these products can vary from industrial and commercial uses, being used as support for creative industries, life-critical systems, entertainment purposes and more. The broad scope of these products lead to the necessity to study deep the design process and how to evaluate the designed products.

The discipline that studies this phenomenon is called Human-Computer Interaction (HCI). It has concerns on the *"(…) design, construction and implementation of human-centric interactive computer systems"*[10]. In the beginning, HCI studies were focused on making the software more appealing and intuitive for people to use it, as it was a task only understandable by professionals and specialized individuals. HCI is concerned with human centric approach in computer mediated interaction scenarios, specifically design and analysis in daily life. Usability issues are part of the analysis procedures of HCI. There is a standardized guide of good-practices covering the ergonomics of HCI, which is called ISO 9241. It is managed by the ISO Technical Committee 159 and has suffered several updates to keep in line with the conceptual and technological upgrades in HCI[11].

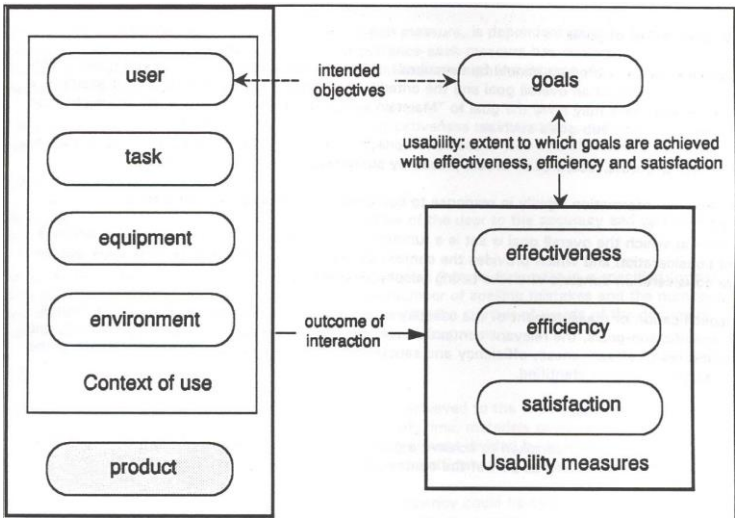

Figure 2 - Usability framework
(from draft international standard ISO/DIS 9241-11 1994-10-17)

[10] Source (Last Visit: 28 October 2014): http://www.webopedia.com/TERM/H/HCI.html
[11] Source (Last Visit: 28 October 2014): http://en.wikipedia.org/wiki/ISO_9241

According to ISO 9241-11, usability definition includes three measures. They are effectiveness, efficiency and satisfaction. The effectiveness refers to the capacity of the users to complete and finish a determined goal or task, the efficiency is the amount of resources spent to achieve a goal/task and satisfaction is about the user's motivation and attitude towards the product. It is wise to remember that these usability measures were created concerning software's where effectiveness and efficiency are crucial to have successful interaction. But in the case of videogames, being efficient is not desirable because "*if there's no challenge to the player while obtaining the goal, the game is boring and not fun. Therefore, if the game is efficient and requires few resources on the part of the player, it may not be successful in its mission to provide entertainment"* (Federoff, 2002) (p.7).

2.3.1. Evaluation and heuristics

Designing a software and evaluating it is not the same thing, and the tools used are also different. There are guidelines and heuristics, but the scope of their usage is not the same. Guidelines are used by designers as good-practices, and their focus is to help them achieve a consistent product matching the final-user needs and expectations. On the other hand, heuristics are used to simplify the process of product diagnostic. As stated in an article in uxmag.com, written by Dana Chisnell, "*Heuristic challenge a design with questions. The purpose of heuristics is to provide a way to 'test' a design in the absence of data and primary observation by making an inspection.(…) They're built to apply to nearly any interface. But they come into play at different points in a design project"*[12] (Chisnell, 2010).

But, what are the aspects that are valuable to evaluate in a videogame?

Nielsen (1994) identified and created a set of usability heuristics for software. The Nielsen's heuristics can be consulted in the table 9 (in the appendix). Those heuristics provide a great

[12] Source (Last Visit: 28 October 2014): http://uxmag.com/articles/are-you-designing-or-inspecting

framework to evaluate software interface, but were not focused on videogames and "*fail in the ability to address game play issues"* (Federoff, 2002) (p.19).

As said before, the general usability measures for software (effectiveness, efficiency and satisfaction) are not focused on videogames and their scope diverges a little. Because of this, it is necessary to have different criteria aimed towards videogames. As cited by Federoff (2002), a new way to deal with the different usability issues of game is proposed by Clanton (1998), where he divides those usability aspects in three areas: game interface, game mechanics and game play. As a brief explanation we can consider game interface as the device used by the player, game mechanics as the physics of the game and game play the process where the player reaches the objective of the game.

Federoff also gathered the heuristics focused on games she found in her literature review and categorized them according to Clanton's three videogame usability aspects. Furthermore she conducted tests in a game development company and tried to verify some of the literature's heuristics and discover more. The final table with a compilation of the heuristics gathered by Federoff (2002), can be seen in the table 10 (in the appendix). These heuristics are more focused on the player's experience while playing, than those proposed by Nielsen (1994). Nonetheless, Federoff heuristics seem to be focused in RPG's, and not in the whole game genres. Adding to this, they aren't very accurate when the evaluated game uses state-of-art technology (Koeffel et al., 2010).

After Federoff, some authors putted effort in making more accurate heuristics. For example, Desurvire et al (2004) released the HEP (heuristic evaluation of playability), where they gave up on the three usability measures used by Federoff (Effectiveness, Efficiency and Satisfaction), and set up four measures. These are game story, game play, game mechanics and game usability.

In 2007, Schaffer introduced a set of heuristics accompanied by graphical descriptions, making it easier and clearer for the evaluator to identify them in a real test environment. (Schaffer, 2007)

Koeffel et al (2010), did an extended literature review and managed to gather and organize the heuristics they found in two categories: gameplay/game story and virtual interface. There is a total of 29 heuristics, 18 concerning gameplay/game story and 11 concerning virtual interfaces. In the table 11 (in the appendix) it is possible to consult the 18 heuristic of gameplay/game story. Those are more focused in this research's thematic.

Even though heuristics are a great tool for inspecting videogames, evaluators shouldn't "*evaluate by heuristics alone, always try to do user testing".* Given this, I will now change the focus to the gamer/user and understand what kind of processes occur during the interaction with the game/product.

2.4. Disposition

When someone plays a videogame, the activity can produce and evoke states and effects. The term used to describe the individual personal experiences while playing videogames is called Game Experience. In order to allow players to have this game experience, videogames must provide experiences, which are related with concepts of immersion, fun, involvement, engagement, presence and flow.

At a first glance, fun is the concept that sounds more familiar to videogame players. But what is fun? Fun can be considered the “special intrinsic satisfaction” that the game offers to the player (McCarthy et al. 2005). Many authors, like (Read & MacFarlane, 2000) or (Dix, 2005) affirm that the concept of fun is related with engagement. Engagement is one of the levels of user involvement with the game (Brown&Cairns, 2004), the first level to be more specific. Before reaching to stages of engrossment and total immersion, the player must be engaged with the game first.

Considering the players experience with the product, in this case a videogame, Hassenzahl and colleagues (Hassenzahl et al. 2000; Hassenzahl, 2001, 2003) said that perceived qualities of an interactive product can be split in two, the pragmatic qualities and the hedonic qualities. The pragmatic qualities refer to the instrumental and functional aspects of the product, and the hedonic qualities refer to the “product’s potential to support pleasure in use and ownership, that is, the fulfillment of so-called “be-goals"” (Hassenzahl, 2010) (p.357). In this topic, I’ll make a summary of the aspects and concepts founded in the literature review that influence user’s hedonic experience and some techniques used to measure these aspects, or at least, that measure pertinent indicators for my research. The reason for the emphasis given to the hedonic aspects is because it supports the idea of “being a “motivator”, capturing the product’s perceived ability to create positive experiences (…) and pragmatic quality being a “hygiene factor” (…) removing barriers but not being a source of positive experience in itself” (Hassenzahl et al. 2010).

2.4.1. Aspects and concepts that influence user's hedonic experience

After proceeding with the literature review, I identified some concepts and aspects that influence the user's hedonic experience. They can be identified and measured in a real context of use, and work as indicators to access the user's hedonic experience.

Optimal experience – Concept of Flow

Providing an optimal experience to a user is the main goal of any interactive product. The flow concept is used to define a mental state of being involved and complete (Csikszentmihalyi, 1990). According to this concept, when the challenges presented match the skills of the person, the optimal experience happens. In other words, "Entering flow depends on establishing a balance between perceived action capacities and perceived action opportunities" (cf. optimal arousal, Berlyne, 1960; Hunt, 1965). Furthermore, the goals must be proximal and there must exist an immediate feedback to acknowledge the user about the progress that is being made.

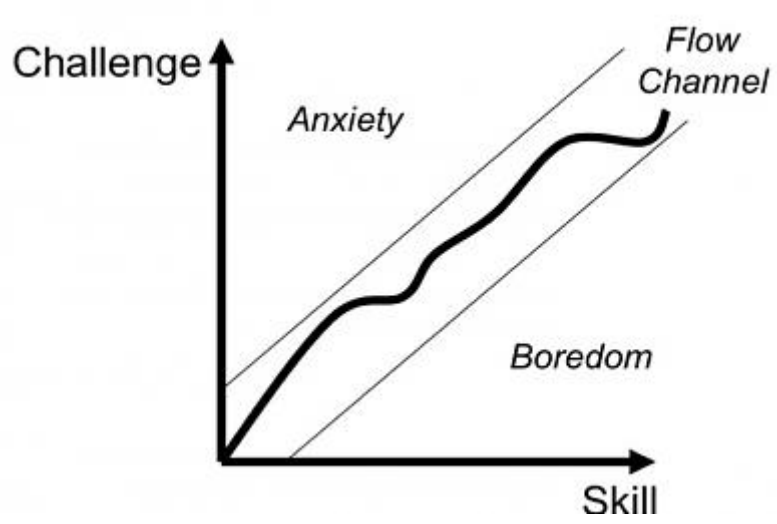

Figure 3 - Flow concept by Csikszentmihalyi, drawn by Senia Maymin.
(source: http://www.pbs.org/thisemotionallife/blogs/flow)

Csikszentmihalyi (1990) identified that under these conditions, the person enters in a subjective state with the following characteristics:

- Intense and focused concentration on what one is doing in the present moment
- Merging of action and awareness
- Loss of reflective self-consciousness
- A sense that one can control one's actions, a sense that one can in principle deal with the situation because one knows how to respond to whatever happens next
- Distortion of temporal experience
- Experience of the activity as intrinsically rewarding, such that often the end goal is just an excuse for the process

Consciousness

Even before the Information Age arrival, humans were 'bombarded' with information. If humans weren't able to filter the relevant information, that would be too much for human brain. So, it developed a defensive strategy that is called consciousness. "Consciousness is the complex system that has evolved in humans for selecting information from this profusion, processing it and storing it" (cf. Concept of Flow, Csikszentmihaly, 1990).
Schmidt (1994a) identified four dimensions of consciousness and they are intention, attention, awareness and control. Intention refers to attend deliberately to a stimulus. Attention is the detection of a determined stimulus, while awareness is related with the subjective experience of attending to that stimulus. Control implies a brain response to the stimulus.
I think that attention is a very relevant process inside the complexity of consciousness. Attention enhances the brain and allows it to concentrate the processing capabilities on important tasks, or at least flagged as important.

Need fulfillment

Hassenzahl and colleagues (Hassenzahl et al. 2010), proposed a categorization of experiences with interactive products, where these experiences would be categorized according to the "primary need it fulfills". The needs that Hassenzahl and colleagues refer are of psychological order. It makes possible for the researchers to link a determined experience between a person and an interactive technological device, with the needs it fulfills. Seven needs were selected, and they are competence, relatedness, popularity, stimulation, meaning, security and autonomy.

The study revealed "a clear relationship between need fulfilment and positive affect, with stimulation, relatedness, competence and popularity being the salient and contributing needs" (Hassenzahl et al. 2010). These results clearly establish the importance of need fulfilment for a positive experience. Moreover, the study also supports the idea of "hedonic quality as being 'motivator'" (Hassenzahl et al. 2010).

Presence

The concept of presence is recent, and has gained more expression with the rise of interactive technologies and devices. The essence of presence is the perception of non-mediation (Lombard & Ditton, 1997). So, *"presence can be understood as a psychological state in which the person's subjective experience is created by some form of media technology with little awareness of the manner in which technology shapes this perception*" (cf. The Role of Presence in the Experience of Electronic Games, Tamborini, Skalski, 2006).

Presence is a multidimensional concept that, depending on the author or area of study, can present different dimensions. Considering presence in a videogame context, there are three categories that are interesting to look at: spatial presence, social presence and self-presence.

Spatial presence triggers the sense of "being there", the sense of being physically located in the virtual world (Ijsselsteijn, de Ridder, Freeman, & Avons, 2000), while social presence refers to experience the virtual actors as though they are actual social actors (Lee, 2004).

Self-presence is when the user experiences his virtual-self as if it is the actual-self (Lee, 2004).

Spatial presence influences the videogame's affect on users. This affect is dependent on the videogames potential to enhance the feelings of involvement and immersion.

Involvement and immersion are something that the user experiences. According to Witmer and Singer (1998), involvement is something that is experienced when the user focus his attention and energy on a stimuli and/or related and meaningful activities. The focus on the stimuli results in the user being cognitively engrossed which characterizes a mental state of vigilance. Immersion is a "psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experiences" (Witmer & Singer, 1998). Experiencing both involvement and immersion are fundamental to experience presence.

2.4.2. Measuring

To answer the research questions it is important to know the indicators that can be measured in an empirical test. Adding to this, I must identify the tools and instruments that are scientifically validated and use them to measure the indicators.

In the case of this study, I will investigate both qualities: the overt and covert responses during an interaction of people playing FIFA14. As said before, the overt responses are 'shown openly' while covert responses are 'not displayed or openly acknowledged'. The researchers in the area of user experience usually are confronted with subjectivity problems when dealing with the data. However, developments in the technology and more contextualized psychological approaches triggered the construction of instruments and the development of strategies focused on data collection.

Covert Responses

Eye Tracking

Eye Tracking is a technique used to know where a person is looking at and the how their gaze is behaving before a given stimulus by measuring the eyes movements. The *Eye Tracking* technology has been used in various contexts which, most of the times, have commercial or research interest. The contexts can vary between web, television, marketing, health related issues, videogames and advertising.

Equipment

As previously said, the *Eye Tracking* technique is used to study the eye movements and the gaze behavior of the study subjects. By studying these movements it is possible to spot moments of attention and interest of the person towards the stimulus. For the purposes of my research I used a stationary but contact-free *Eye Tracking* device from *Tobii*[13].

Figure 4- TOBII Eye Tracker used in the tests.

[13] More information at (Last Visit: 28 October 2014): http://www.tobii.com/en/

Tobii Eye Trackers method used to access the gazing behavior is an upgrade of the PPCR technique and it consists in pointing an infrared light to the eyes of the person. This will create reflection patterns in the cornea and pupil of the person, that will be captured by two cameras placed on the device. Using image processing algorithms it becomes possible to know the point of regard of the person.

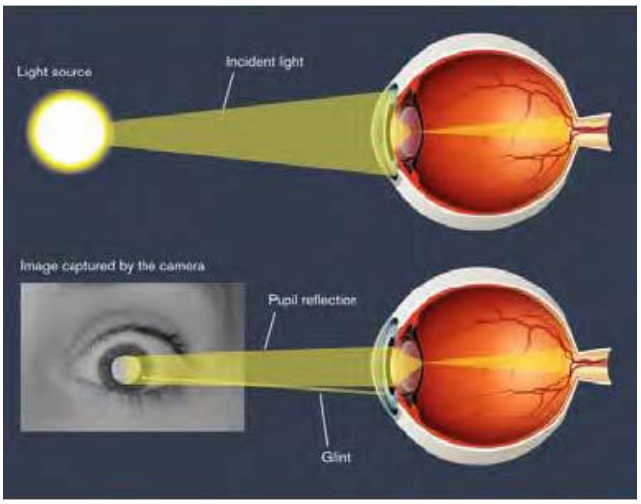

Figure 5 - PPCR technique. (source: *http://www.tobii.com/Global/Analysis/Training/WhitePapers/Tobii_EyeTracking_Intro*)

To turn the raw data into useful data it is necessary to use the software *Tobii Studio*. It allows to define areas of interest, scenes and segments, and exports well defined data. Adding to this the software also gives access to an array of pre-defined parameters like pupil dilation and saccades index of the gaze behavior data.

Indicators

Just and Carpenter (1976) said that what the person is looking at may be assumed as being at the "top of the stack" of the cognitive processes. In my research I am using some well-defined indicators that are related with the gaze behavior of the participants.

Fixations

Fixations are "moments when the eyes are relatively stationary, taking in or 'encoding' information" (cf. Poole & Ball, 2005).

Eye-Movement Metric	What it Measures	Reference
Fixation Count (Overall)	More overall fixations indicate less efficient search (perhaps due to sub-optimal layout of the interface).	Goldberg & Kotval (1999)
Fixation Duration	A longer fixation duration indicates difficulty in extracting information, or it means that the object is more engaging in some way.	Just & Carpenter (1976)
Total Fixation Duration	It is best used to compare attention distributed between targets. It can also be used as a measure of anticipation in situation awareness if longer gazes fall on an area of interest before a possible event occurring.	Mello-Thoms et al. (2004); Hauland (2003)
Time to First Fixation	Faster times to first-fixation on an object or area mean that it has better attention-getting properties	Byrne et al (1999)

Table 1 - Fixation Indicators. (Poole & Ball, 2005).

Saccades

Saccades are "quick eye movements occurring between fixations" (cf. Poole & Ball, 2005). It can be assumed that we are information blind during saccades, which means that no information is being processed at that moment.

Eye-Movement Metric	What it Measures	Reference
Number of Saccades	More saccades indicate more searching	Goldberg & Kotval (1999)
Saccade Amplitude	Larger saccades indicate more meaningful cues, as attention is drawn from a distance.	Goldberg et al. (2002)

Table 2 - Saccades Indicators (Poole & Ball, 2005).

Pupil Dilation

The pupil size can be used as an indicator of cognitive workload, with larger pupils possibly indicating more cognitive effort (Marshall, 2000; Pomplun & Sunkara, 2003).

Pupil dilation can be an indicator of attention and interest of the person that is being measured. For example, White and Maltzman (1977) had setup an experiment, where the participants listened to excerpts from three books: one was erotic, the second involved mutilation and the third was just a casual story. In a first instance, the participant's pupils widened in all of the three, but only kept wide in the first two excerpts. This can work as an indicator of interest, as the pupils stay dilated while there's interest.
Thinking hard makes the pupils go wider, as stated by Hess and Polt (1964), when they noticed that when given harder tasks, the participants of their test pupils got bigger.

However, when the brain reaches a point of overload, pupils tend to constrict. Poock (1973) reported that the pupils constricted when participants had much brain effort.

EDA (Electro Dermal Activity)

Electrodermal activity (EDA) is a response system that has been broadly used in the history of psychophysiology. The variety of questions and topics using EDA measurements range from "(…) basic research examining attention, information processing, and emotion to more applied clinical research examining predictors and/or correlates of normal and abnormal behaviour" (Dawnson, Schell & Filion, 2007). The reason for this wide use of the technology is "(…) due in large part to its relative ease of measurement and quantification combined with its sensitivity to psychological states and processes." (Dawnson, Schell & Filion, 2007).

Measuring the electric conductance of the skin is an objective measurement of arousal, and is linked with psychological concepts of emotion and attention. It is related with the production of sweat, which is controlled by the human's sympathetic nervous system (cf. Nacke, 2009).

Equipment

To collect the EDA data, it is known as a good practice to place the sensors in the palm of the hand. In the case of my experience that is not possible because the participant needs to have free hands to handle the controller. So the sensors are placed in the back of the neck.

Figure 6 - EDA sensors placed on the back of the neck.

The data collected by the sensors was recorded in a SD card placed in a Varioport device. This data was later passed to the computer and treated in the Variograf software.

Indicators

The EDA measurements, as said before, can bring relevant insights on concepts like arousal, emotion and attention. EDA is divided into phasic and tonic reactions. The phasic skin conductance responses are interesting to study the amount of actual arousal caused by a stimulus, while the tonic reactions are useful to study general states of arousal and alertness (Dawnson, Schell & Filion, 2007).

When measuring, the obtained data is divided into different parameters and their definitions can be consulted in the table below.

Measure	Definition
Skin conductance level (SCL)	Tonic level of electrical conductivity of skin
Frequency of NS-SCRs	Number of SCRs in absence of identifiable eliciting stimulus
ER-SCR amplitude	Phasic increase in conductance shortly following stimulus onset
ER-SCR latency	Temporal interval between stimulus onset and SCR initiation
ER-SCR rise time	Temporal interval between SCR initiation and SCR peak
ER-SCR half recovery time	Temporal interval between SCR peak and point of 50% recovery of SCR amplitude

Key: ER – event-related; NS – non-specific; SCR – skin conductance response

Table 3 - EDA indicators (Dawnson, Schell & Filion, 2007).

Overt Responses - Questionnaire

To access overt responses from the participant I set up a questionnaire to be delivered and answered during the tests. The questionnaire was divided in three parts, which were answered in different times. The first part that was answered in the beginning of the test, included explorative questions about the gender, age, gaming activity and familiarity with football. Among those were some directly related with the research questions. As an indicator of skill, participants were asked how regularly they play FIFA14 and how skilled they think they are in it. Also it is asked what their penalty kicking strategy is. To end the first part, I used a Self-Assessment Manikin (SAM) scale to access their affective valence, arousal and dominance in that specific moment. The second part of the questionnaire consisted in the SAM scale, and it is asked between the conclusion of the skill practices and the beginning of the match. The third and final part of the questionnaire was administered in the end of the match, and it consisted in answering a SAM scale, an In-Game Experience Questionnaire and some questions regarding the brand placement.

Self-Assessment Manikin

As described by Bradley and Lang, "the Self-Assessment Manikin (SAM) is a non-verbal pictorial assessment technique that directly measures the affective valence, arousal, and dominance associated with a person's affective-reaction to a wide variety of stimuli." (cf. Bradleys & Lang, 1994). The figure below shows the pictures used in the SAM scale.

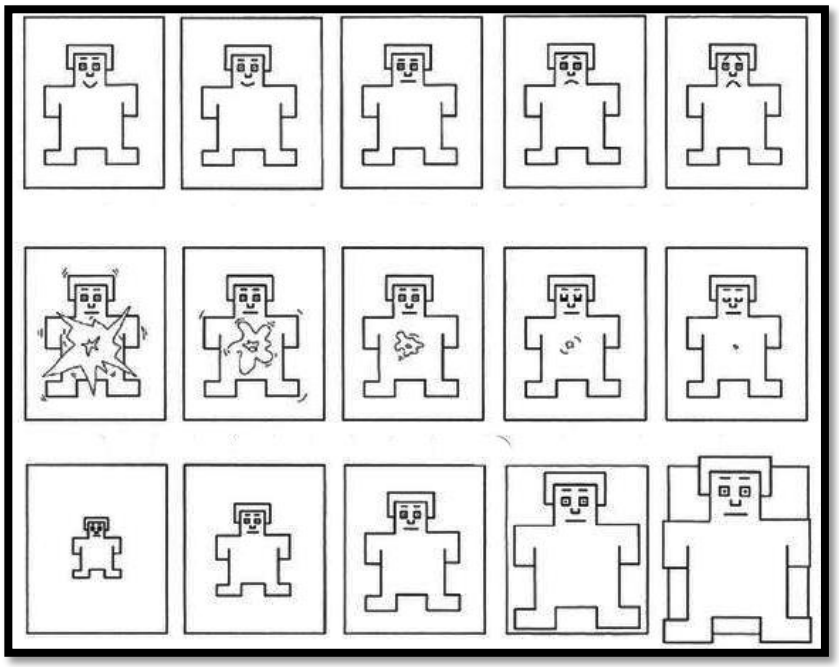

Figure 7 - The Self-Assessment Manikin (SAM) used to rate affective dimensions of affective valence (top panel), arousal (middle panel), and dominance (bottom panel).

iGEQ

The iGEQ (in-game experience questionnaire) is a smaller version of the GEQ (game experience questionnaire), which is being developed by de Kort and IJsselsteijn team in the game experience lab (IJsselsteijn et al., 2008). It consists in 14 statements used to access the participant game experience based on items, like positive affect, negative affect, competence, immersion, flow, challenge and tension. Each of these seven items have 2 statements that can be classified in a five point scale, from 0 (not at all) to 4 (extremely). The iGEQ can be consulted in the appendix (table 29).

2.5. States While Gaming

Motivation is a general term that is associated with the will force that thrives someone to endure or perform an activity. Is a "psychological feature that arouses an organism to act towards a desired goal and elicits, controls, and sustains certain goal-directed behaviors. It can be considered a driving force; a psychological one that compels or reinforces an action toward a desired goal" (Schacter, 2011).

The factors that can justify or explain motivation vary according to the theory or the scope of the activity. People can have intrinsic or extrinsic motivations, whether they perform an activity expecting or not an outcome. Intrinsic motivation is when someone engages an activity just by his pleasure or interest in doing that specific activity, without expecting a reward (Ryan and Deci, 2000). On the other hand, extrinsic motivation is when someone engages an activity expecting a reward, fearing a punishment or having an external support (like when you are being cheered). People that engage a task with intrinsic motivation tend to spend more time doing it, however someone that initially started a task with extrinsic motivation, can develop an intrinsic interest in it (Wilson & Lassiter, 1982).

The self-determination theory focus is to understand how much an individual is self-determined and what the reason for the inner motivation is. According to the self-determination theory, there are three needs which need to be fulfilled to foster well-being and health: competence, relatedness and autonomy. Competence is related with the search to control and master a task (White, 1959), while relatedness is the need to interact and experience with others (Baumeister and Leary, 1995). Autonomy is the will to be independent and in harmony with the self's ideals. These needs can fuel and motivate people towards action. Furthermore, Deci and Vansteenkiste assumed three elements (Deci and Vansteenkiste, 2004):

- Humans are inherently proactive with their potential and mastering their inner forces;
- Humans have inherent tendency toward growth development and integrated functioning;

- Optimal development and actions are inherent in humans but they don't happen automatically.

This theory shows the humans growth towards positive motivation. However, if the basic needs are not satisfied, it may prevent them from reaching it.

2.5.1. Emotion

Defining emotion was never a consensual matter. Emotion as a word is widely used in many different situations, but some researchers attempted to define it. From a psychological point-of-view, Dolan (2002) believes that it can be characterized in three different points. First, emotions are experienced both mentally and in the individual's body, not like thoughts that stay in the person's head. The second characteristic refers to the difficulty to control emotions. Unlike thoughts, emotions are hard to counter. The third characteristic is the influence of emotions in human behavior.

Defining the causes that trigger emotions, have been cause of controversy. In the literature reviews, I found two different theories regarding emotion: the James-Lange theory (James, 1884; Lange, 1994) and the Cannon-Bard theory (Cannon, 1927).

According to James-Lange theory, emotion is the result of the interpretation of arousal and physiological changes caused by an event. So, from this point-of-view, emotions are a mere response to the brains interpretation of physiological changes triggered by an event. Cannon-Bard theory says that, otherwise, the event can also cause the emotion. In this theory, the emotion and the physiological changes are caused simultaneously, and are independent.

Davidson, Scherer and Goldsmith (2003) approach separated affect in three different components: emotions, feelings and moods. Emotions refers "to a relatively brief episode of coordinated brain, autonomic, and behavioral changes that facilitate a response to an external or internal event of significance for the organism" (Davidson, Scherer & Goldsmith, 2003) (p.13). In other instance, feelings are the internal and subjective experience of the

emotion itself. The mood is "typically refers to a diffuse affective state that is often of lower intensity than emotion, but considerably longer in duration" (Davidson, Scherer & Goldsmith, 2003). In opposite to emotions, moods don't need a clear stimulus.

2.5.2. Affective-emotional effects of videogame playing

Emotions have a great impact in one's behavior and cognitive development. If videogames can trigger emotions, it can be assumed that they can be used to change the way people perceive themselves and the surrounding environments. The change can be either positive or negative.

One of the most focused aspects of videogame playing is the educational role it can provide. Videogames are potential learning tools, because they support "multi-sensory, active, and experiential and problem-based learning" (Oblinger, 2004). Furthermore, previous acquired knowledge is remembered in order to make possible for the person to progress in the game, and with immediate feedback. This makes the testing of hypothesis and instant learning possible.

Gentile and Gentile (Gentile & Gentile, 2008), considered videogames a key learning tool due to their "reinforcement ability, the emphasis on distributed practicing of skills and the active involvement and motivation of the learner in the task".

On the other side, there are studies regarding the negative effects of playing videogames. Padilla-Walker and colleagues (Padilla-Walker et al. 2010) study results suggested that playing videogames with ages between 18 and 26 had subdued risks, with the subjects having higher levels of drug use, alcohol drinking, and poorer relationships with friends and family. Furthermore, it seemed that, among females, videogame playing was connected with lower self-worth.

However, when it comes to emotions, videogames as a form of media, constitutes one of the top reasons for individuals to manage their moods and enhance their emotional states (Ruggiero, 2000). Some studies suggest the existence of a causal relation between playing

preferred videogames and improved mood and enhancing of positive emotions (Russoniello, O'Brian, & Parks, 2009).

Videogames are also used by people to trigger intense emotional experiences (McGonigal, 2011). There are goal concepts that players try to achieve when they enter this activity. The already referred Flow, which is a positive emotional experience described by gamers, has been linked to positive outcomes in adolescents, including commitment and achievement in high-school (e.g., Nakamura & Csikszentmihalyi, 2002) higher self-esteem, and less anxiety (Csikszentmihalyi, Rathunde & Whalen, 1993).

There are studies that suggest that individuals turn to games to regulate their emotions (Olson, 2010). Emotion regulation towards a positive and beneficial outcome using videogames can be seen as strategy. However, games also trigger negative emotions, like frustration, anger, anxiety and sadness. Despite these negative emotions, players may endure them to achieve the proposed goals, and reach satisfaction.

2.6. Relevance of the Literature Review

The literature review present in this document works as a resume of the theories, concepts and aspects that I studied in order to be able to answer to my research purposes. The first two topics are more focused on contextualizing the reader towards what is a game, and what is a videogame. The third chapter gives insights on what is usability and how to evaluate a product usability, from a pragmatic point-of-view. The two final chapters are more related with the theories and concepts related with the player's hedonic experience. The fourth chapter gives insights on the concepts and aspects that can be used to access the gaming experience, and also which instruments may be used to do this. The fifth and final chapter gives some insights about what are emotions/moods and how videogames can influence them.

3. Empirical Study

3.1. Research Questions and Deducted Hypothesis

Having the literature review done, it becomes possible to revisit the research questions and set up some hypothesis for them.

RQ1: Are gaming skills a moderator for gaming experience?

Regarding the object of study, FIFA14, some players have better skills playing it. That may be because they play it more often, or have experience in other soccer videogames, which leads to a better understanding of the game flow. Player's with more experience with the game will likely be more comfortable and efficient playing it. Further we have to assume that players with better skills are more successful playing the game, having better results than low skilled players. Other variable that may influence the results is the level of difficulty of the challenge presented to the player. The optimal experience will more likely occur when the challenge presented matches the skills of the player. Using the iGEQ it is possible to access some of the participants insight's on their own experience. The insights will be about competence, immersion, flow, tension, challenge, negative affect and positive affect.

> **H1:** *Participants with a high degree of gaming skills will have higher values measured in the competence, positive affect and immersion components of the iGEQ than the participants with low degree of gaming skills.*

> **H2:** *Participants with a high degree of gaming skills playing in the professional level will have higher values measured in the flow and challenge components of the iGEQ than the rest of the participants*

Operationalization H1 and H2: I need to divide the participants in groups according to their skill. To identify their skill, they will be asked to do three skill practices inside the game and answer two questions. This five items combined will give a value that will be used to divide them in 3 groups (high, medium and low skills). Adding to this, the participant would play against an amateur or professional opponent. It was defined in a systematic way so, for example, the participant 1 would play against an amateur opponent, the participant 2 against a professional opponent, the participant 3 against an amateur opponent and so on. Having this, participants will have to answer an iGEQ after they play the FIFA match.

For the third hypothesis, players that have better skills playing a videogame are likely to feel more dominant when dealing with it, than less skilled players. With the sense of control, players will also have a better experience with the videogame.

> **H3:** *Participants in the high skill group will have more positive results in the dominance and affective valence variable of the SAM scale than the participants located in the low skill group.*

Operationalization H3: A SAM scale will be present in three parts of the questionnaire: one at the beginning of the test, one after the participants play the skill practices and one at the end of the test. The idea is to observe the values obtained in the different parts of the test and compare the participants from each group. Adding to this, it will be possible to observe if playing the match had a positive or negative effect on the values obtained.

For the hypothesis 4 and 5, the size of the pupils can be used as an indicator of cognitive workload, with larger pupils possibly indicating more cognitive effort (Marshall, 2000; Pomplun & Sunkara, 2003). It is possible to use this indicator to access moments or peaks of attention/interest from the participant towards the challenge. In that sense, there is also EDA that can work as an indicator of attention. Measuring the electric conductance of the skin is an objective measurement of arousal, and is linked with psychological concepts of emotion and attention. It is also expectable to see relevant differences between the skill groups (high and low skilled).

> **H4:** *Pupil dilation measurements correlate positively with EDA measurements.*
>
> **H5:** *Participants placed in different skill groups will produce different measurements (pupil dilation/EDA).*

Operationalization H4 and H5: In the tests I will measure the EDA and pupil dilation of the participants. With the data collected I will statistically compare the values obtained in the match concerning the pupil diameter (mean) and the EDA (sum of amplitudes). Then I will see if there is a relevant difference between the values in each of the skill groups.

For the last hypothesis regarding the research question 1, a higher skilled player has more experience with the game, so it is expected that he is more familiar with the interface. Further, he can take more advantage of the interface features. In the case of FIFA14, there is a miniaturized map that shows the playing field and indicates the positions of the figures and the ball in a symbolized way centered on the bottom of the screen. This can be a benefit for a more experienced player, so it is expected that they look at it more often than less skilled players.

H6: *Higher skilled players will have more fixations in the minimap.*

Operationalization H6: The participant will play a FIFA match, and their gaze behavior is being recorded. After having collected the data, I will define an area of interest on the minimap and compare the results between the participants of the two skill groups (high and low skilled).

RQ2: Does an explicit strategy for penalty kicks influence the gaze behavior and the performance of the player during the penalty kick?

The first hypothesis will test if the penalty kicking strategy declared by the participant in the questionnaire will have effect on the gaze behavior of the participant. I expect that a participant that declares to have a goalkeeper dependent strategy to have a gaze behavior more focused on the goalkeeper, in a penalty kick situation inside FIFA14.

H1: *Participants that declared to have a goalkeeper dependent penalty kicking strategy show a gazing behavior that is more focused on the goalkeeper than participants without such strategy.*

Operationalization H1: In the first part of the questionnaire, the participant will be asked what his favorite penalty kicking strategy is (goalkeeper dependent, goalkeeper independent or no strategy). Then he will have to shoot 5 penalties in FIFA 14, while his gaze behavior is being recorded. With the recorded data, I will define areas of interest on the relevant elements of the graphic interface and compare the fixation values.

For the hypothesis 2, following a real life study concerning the effects of the chosen strategy in a penalty kick situation, revealed that "(…) the goalkeeper independent strategy is superior to the goalkeeper dependent strategy (…)" (Noel & Van Der Kamp, 2012) . I'm expecting this to happen in a virtual environment, like FIFA14.

> **H2:** *Participants that declared to use a goalkeeper independent strategy are more successful than gamers without such strategy*.

Operationalization H2: I'll proceed the same way as I did in the H1 and H2, but this time I will compare the number of goals scored by participants in each group (goalkeeper dependent vs. goalkeeper independent strategy).

RQ3: The brand placement in the goal nets is recognized and remembered by the players?

This question is focused on brand placement inside videogames and if they are recognized and remembered by the players. In the case of FIFA14 there was a game element that triggered my interest as a potential place for brand placement: the goal net. The goal net is displayed in a big size in some video frames and is also a privileged spot – everyone wants to score a goal. I'm expect that the majority of the participants will recognize and remember the adidas brand placement on the goal net.

H1: *The number of participants that recognize and remember the brand placement will be >50% of the total number of participants.*

Operationalization H1: As we seen in the research question 2, the participants had to shoot 5 penalties in FIFA14, while their gaze behavior was being recorded by the tracker. While they are shooting the penalties, the participants are also being exposed to the brand placement stimuli. In the end of the test, the participants will answer to some questions of the questionnaire, whose purpose is to see if they have recognized the brand placement.

3.2. Methodology

The methodological approach that is going to be adopted for this investigation is divided into a theoretical phase and an empirical phase. These two phases are different but they complement each other.

In a first instance it is important to look at the research questions and proceed with an extensive literature review, containing the topics and concepts that can support future empirical tests, data analysis and conclusions. After having done this, it is time to setup the empirical tests to collect the desired data. The participants will be asked to play FIFA 14, which is the chosen object of study. They will perform three skill challenges and a match against a computer controlled opponent. While they perform this task, their gaze behavior, pupil dilation and electro dermal activity data is being collected and recorded. Adding to this, participants will answer a three-step questionnaire. With this data, it will be possible to answer the research questions of this study.

3.2.1. Object of study characterization

In every research it is always fundamental to have an object of study that is the focus of the analysis. The object of study that is going to be used and analyzed in this empirical research is the videogame FIFA 14. It is a sports videogame that is distributed by EA Sports, a branch of the main EA (Electronic Arts) company. It seemed fit for this research because it is easy to control in a laboratory experiment. The match feature provides the researcher with the possibility to replicate the same settings for each participant (like the duration of the match, difficulty level of the computerized opponent, teams used), making it possible to provide a similar experience to every participant.

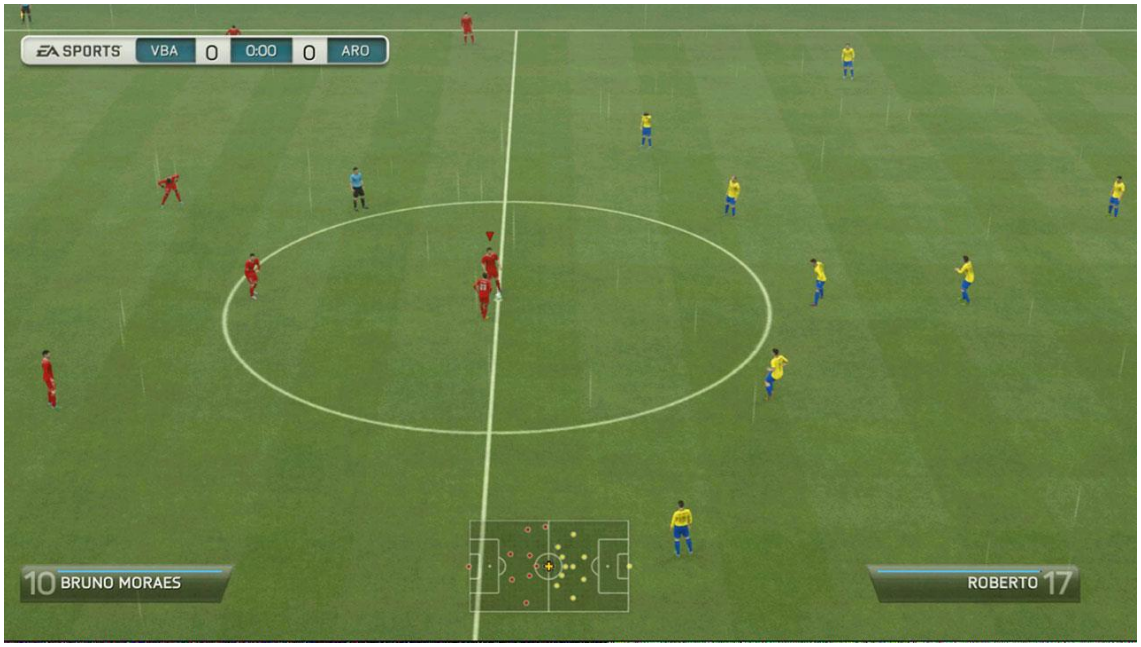

Figure 8 - FIFA14 match.

Adding to this, the game still has the skill practice feature, which allows the participants to undertake some defined challenges and have their performance/score registered. This revealed to be a benefit for my research, so I can easily compare the skills of the participants and form groups for the further analysis.

3.2.2. Target public characterization

The population of this study are all the videogame players, aged above 18, from all countries. The reason to restrict the population to videogame players is that the focus of the study is on the experience with the game itself and not with the console interface. The empirical part of my study was held in the Institute of Communication and Media Research of German Sport University Cologne. During my stay in the Institute, I managed to do a pre-test for validation purposes and after it, 41 participants were tested in a controlled environment (39 Male, 2 Female).

3.2.3. Technological requirements

In the tests I wanted to measure overt and covert responses from the participants. Concerning the covert responses, I needed to collect data regarding the participants gaze behaviour, pupil dilation and electro dermal activity. For the gaze behaviour and pupil dilation I used Eye Tracking technology. It makes possible for me to have insights on the fixation and saccades behaviour of the participant in determined areas. The diameter of the pupil that is recorded will work as an indicator of interest in the match situation and the electro dermal activity as an arousal and activation indicator.

The electro dermal activity data is divided in phasic and tonic reactions and it was collected by placing two sensors on the back of the participant's neck and using a Varioport device. Further it was treated using the Variograf software.
For the overt responses I used a questionnaire. At first the questions were formulated in English, but because the participants were mainly German native speakers, I managed to translate it to avoid interpretation problems and additional cognitive effort. I used a web platform called Unipark EFS Suite.

The data treatment and analysis is going to be done using Microsoft Excel and/or SPSS. In the case of the eye tracking data, before going into the statistical software, it is necessary to define areas of interest and timestamps in the TOBII studio software, so I can export only the data that is important for the research.

3.2.4. Participants

The laboratory experiments took place during the month of March of 2014. They were held up in a laboratory in the Institute of Communication and Media Research of German Sport University Cologne. To reach the desired participants, an open call was made, and some flyers were posted in the University. The interested people could use the QR code that was in the flyers and book their participation there. It was a little harder to get the desired

number of participants due to the fact that there is a break in the academic activity during the month of March.

In the end, I registered 41 participations in the tests (39 male, 2 female). The age of the participants varied between 18 and 38, with a mean value of 25 (24,68). Concerning their gaming activity, 37 (90,2%) affirmed that they play console games, while 4 (9.8%) don't do it. Regarding the console in which they play, 30 (73,2%) use the Playstation, 18 (43,9%) use the XBOX, 10 (24,4%) use the Wii, 1 (2,4%) uses portable consoles of any kind and 4 (9,8%%) admitted to use other platform that was not listed in the questionnaire to play video games. There are participants that don't restrain their gaming activity to a single platform/console. 4 participants didn't answer this question.

The majority of participants (95,1%) admitted that they played FIFA at some point in their life. Most of them play it casually. 22 (53,7%) affirmed that they play it less than an hour per week. 14 (34,1%) play it between 1 and 5 hours per week, while 3 (7.3%) reveal a more intimate relation with the game, playing it 5 to 10 hours a week. None of the participants declared to play more than 10 hours a week. 2 of them didn't answer to this topic.

3.2.5. Procedure

The experiment was setup in a controlled environment, and the participants always followed the pre-designed experiment protocol. The participant would enter the room and sit in front of the screen. Then he would be asked to fill a preliminary questionnaire that consisted in exploratory questions to collect data about the gender, age, gaming activity and familiarity with football. As an indicator of skill, participants were asked how regularly they play FIFA14 and how skilled they think they are in it. Also it is asked what their penalty kicking strategy was. To end this preliminary questionnaire, I use a Self-Assessment Manikin scale to access their mood, arousal and dominance in that specific moment.

After this the participant would have the first encounter with the game itself. They needed to do a calibration in the eye tracker and after that they were asked to play three different skill practice challenges: advanced ground passing, shooting and penalty situation.

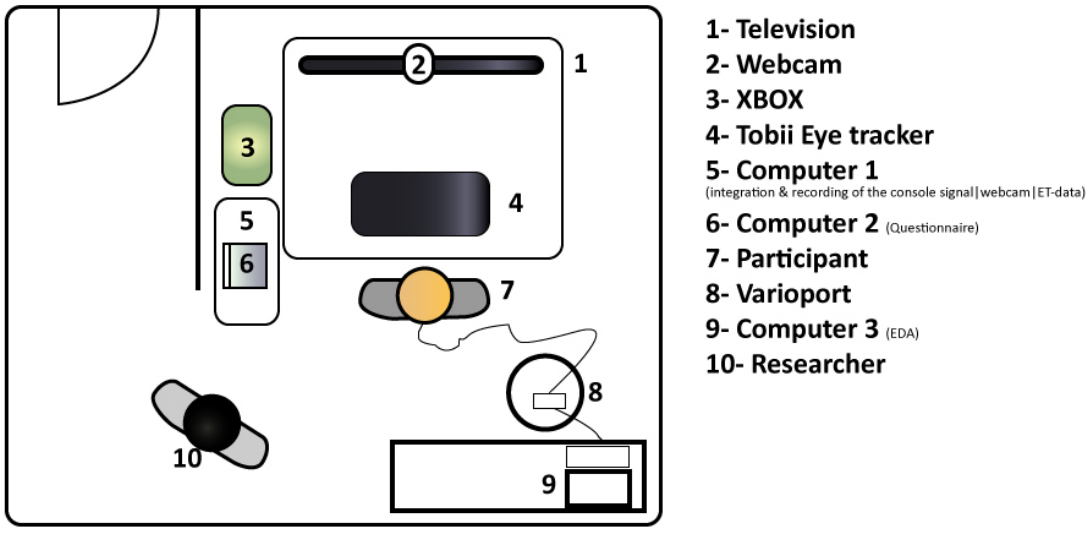

Figure 9 - Test room elements.

When the skill challenges were completed, the participant would be asked to answer a SAM scale. After this they would proceed with another eye tracker calibration and proceed to play the FIFA match. The participants would be limited to play with a pre-determined team. This was done to avoid that fanship interfere with the collected data and to keep the test similar to every participant. Adding to this, the participant would play against an amateur or professional opponent. It was defined in a systematical way so, for example, the participant 1 would play against an amateur opponent, the participant 2 against a professional opponent, the participant 3 against an amateur opponent and so on. In the end of the match, participants would answer the final questionnaire that consists in a SAM

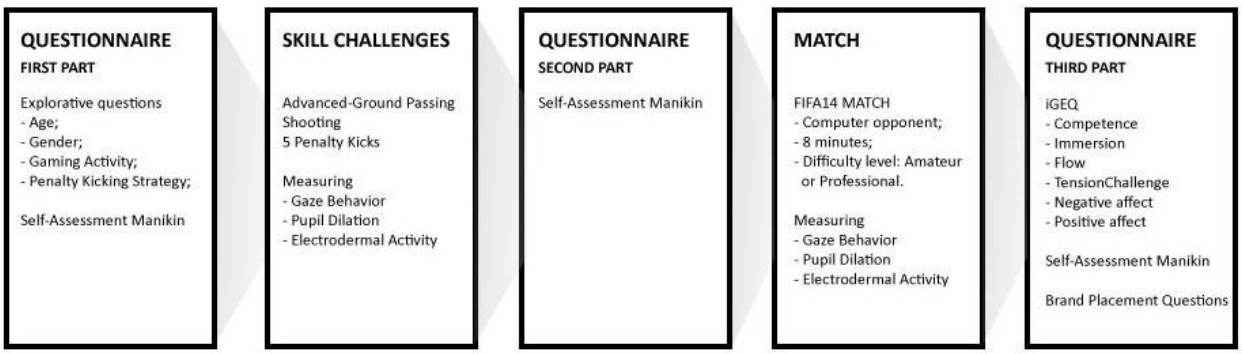

Figure 10 - Test steps described.

scale, an In-Game Experience Questionnaire and some questions regarding the brand placement. In the end of the experiment I would explain and clarify the participants about my real intentions with the experience, thank them and dismiss them.

3.3. Results

In this chapter the data that was collected in the tests is going to be presented and analyzed. The order in which the results are presented is based on the research questions. First the results concerning the explorative part of the test. This data is used to characterize the participants involved in the tests, and it was collected in the questionnaire. Further will be shown the results for the research questions. The data that will be used to get the results was collected using both Eye Tracking and EDA technology and also a questionnaire.

3.3.1. Test participants characterization

The test was made to 41 participants (39 male, 2 female). The age of the participants varied between 18 and 38 with a mean value of 24.68 (M=24.68; SD=3.16). In the graphic below it is possible to see the distribution of the participants according to their age.

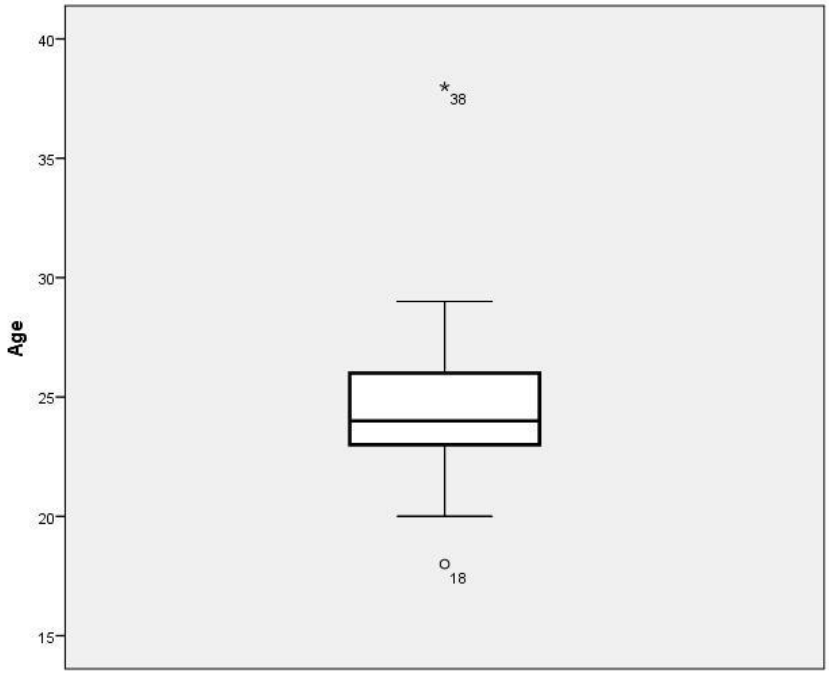

Figure 11 - Age of the participants distribution - Box plot graph.

The questionnaire also had questions regarding the participants gaming habits. The participants revealed to be very familiar with console videogames. From the total of participants (N=41), 37 (90.2%) declared that they play console videogames. Further, and regarding the platforms used, it is possible to observe that Playstation is the most used console, followed by XBOX and Wii. Just one participant declared to play in a portable console.

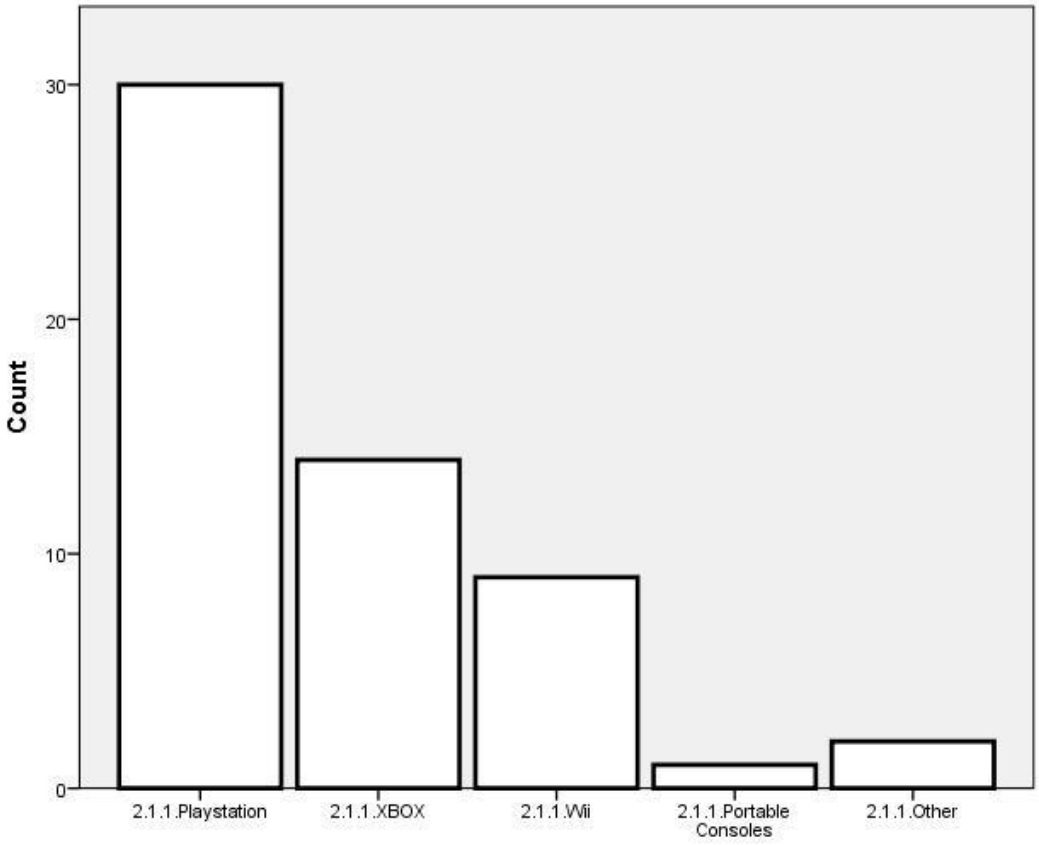

Figure 12 - Consoles used by the participants.

After knowing the information regarding the general experience of the participants with console videogames, it appeared to be relevant to understand their familiarity with FIFA game series. When asked if they had played FIFA anytime during their life, 95.1% (N=39) said yes. This reveals how good and broad is the implementation of the FIFA game series among gamers. Further it was asked how regularly, on a weekly basis, they play the game. Most of the participants (56.4%; N=22) admitted to play less than one hour a week, while 14 (35.9%) said that they play between 1 and 5 hours in the same time interval. Only 3 (7.7%) admitted to play between 5 and 10 hours a week, and none assumed to play more

than 10 hours each week. This possibly shows a casual relation with the game, where the majority of the participants don't dedicate many hours a week to play it.

3.3.2. Research Question 1 - Are gaming skills a moderator for gaming experience?

The first research question, which was already presented before in this dissertation, is focused on the relevance and influence that the skills of a gamer may have on the gaming experience. In order to be able to compare the results according to their skills, I need to divide the participants in two groups: one composed by players with high skills and the other with low skilled players. It must be noted that by saying high skilled players, I'm not assuming that they are professionals in any way, but they present better skills than the ones in the low skill group. To do this I developed a method to rate their skill and proceed with group division. The method consists in the aggregation of five different parts (later, it was reduced to four).

Two of the parts were questions presented in the questionnaire. One of the questions was about the regularity in playing FIFA, which gives insights on the amount of time spent playing it. The other question was meant to explore the self-awareness of the participant regarding is own skills playing the videogame. Participants were asked how skilled they think they are playing FIFA, rating it in a scale from 1 to 10 (1 being extremely low-skilled and 10 being high-skilled).

The three remaining parts were in-game challenges where the score, provided by FIFA, was used for the rating. The first consisted in a ground-passing challenge, the second was a shooting challenge and the third was a penalty kicking challenge.

In the graph below we can see the answers given by the participants to the question about how skilled they are. It is very notorious that most of them consider their skills to be very high. A good statistical support for this is the median, which is 9, while the mean is 8.51 (M=8.51; SD=1.71) (see table 12, in the appendix).

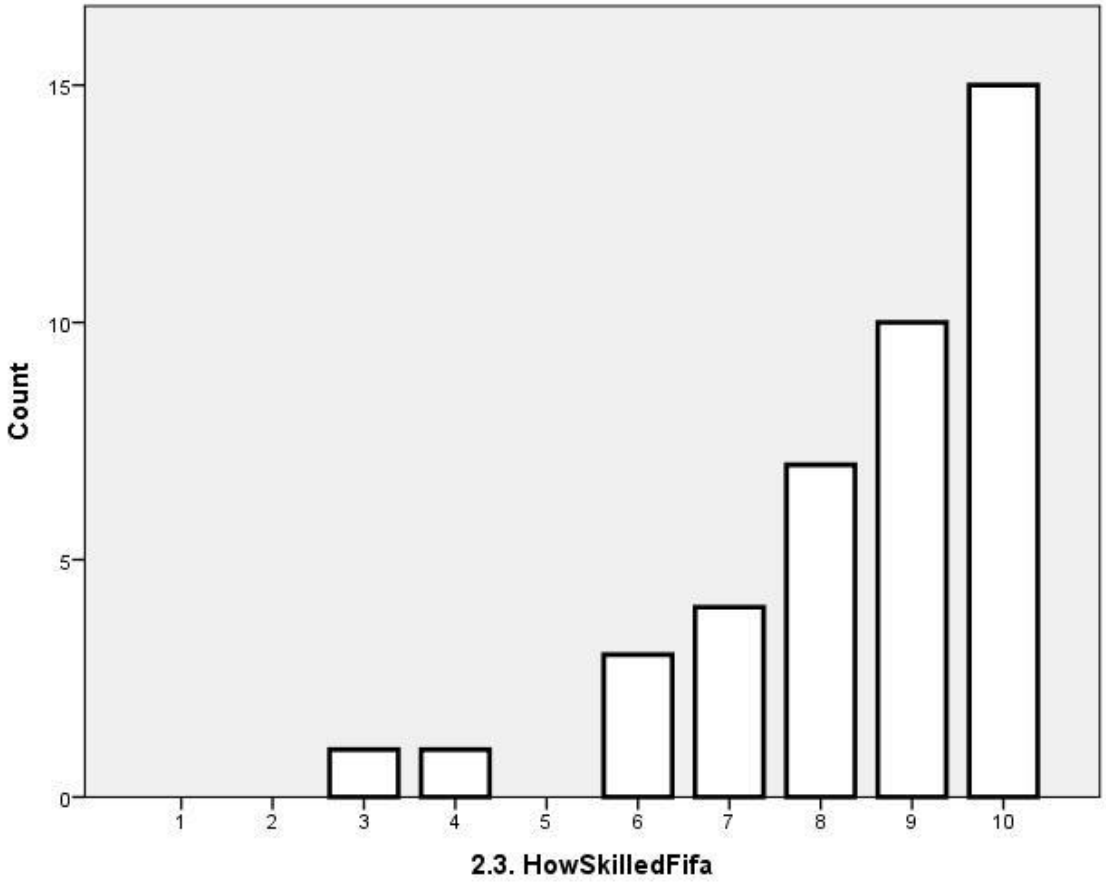

Figure 13 - Participants skill self-rating.

In the table 13 (in the appendix) it is possible to see the scores of the participants in the three in-game challenges. To be able to combine the results of the 5 different parts I transformed all of these values in Z Scores. This way it is possible to test the internal consistency of the data. The table containing the detailed Z scores can be consulted in the tables list (see table 14, in the appendix).

With this values it is possible to analyze the internal consistency of these items, and see how strongly they work together. To do this I will apply the internal consistency test, and look at the Cronbach's alpha coefficient. The returned value was 0.655 (α=0.655) for the 5 items. This is already an acceptable value, but I want to see if there is any of the items that is negatively influencing the Cronbach's alpha coefficient, and if that happens, drop that item off.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Zscore(Fifa_Often) 2.2.1.HowOftenFifaWeek	,1237780	6,570	,546	,322	,535
Zscore(SkillFifa) 2.3. HowSkilledFifa	,0782878	7,455	,412	,221	,602
Zscore(ScoreSP2) Score Skill Practice 2	,1009116	7,035	,424	,292	,595
Zscore(ScoreSP1) Score SkillPractice 1	,0719484	6,861	,481	,284	,568
Zscore(Penalty) Number of penaltys scored (5 possible)	,1201862	8,121	,204	,084	,696

Table 4 - Detailed Cronbach alpha's values.

Observing the column "Cronbach's Alpha if Item Deleted", I quickly notice that if I exclude the values for the penalty challenge, I get a bigger internal consistency (α=0.696), which is an acceptable value.

After excluding that item, I will make the mean of the Z values and form groups based on this mean. I understand that I can't just list the participants and make 50% high-skilled and 50% low skilled, because there would be participants with similar skills in different groups. Given this, I created a "barrier" called the medium-skilled players. These medium-skilled players are the 20% located in the middle of the list, while the top 40% are the high-skill players and the low 40% are the low-skilled players, for this dissertation purposes.

In the table below it is possible to observe the medium of the Z-values and the skill group attributed to each participant, based on this method. Adding to this, it is possible to see the level of difficulty they played the FIFA match (Amateur or Professional), and the outcome of the game (Victory, Draw, Loss) (see table 15, in the appendix).

To have a more graphical impression about how these attributes work together, we can observe the graph below. It is possible to see that the high-skilled players playing in the amateur level have a great victory rate, while the low-skilled players playing professional have bad results.

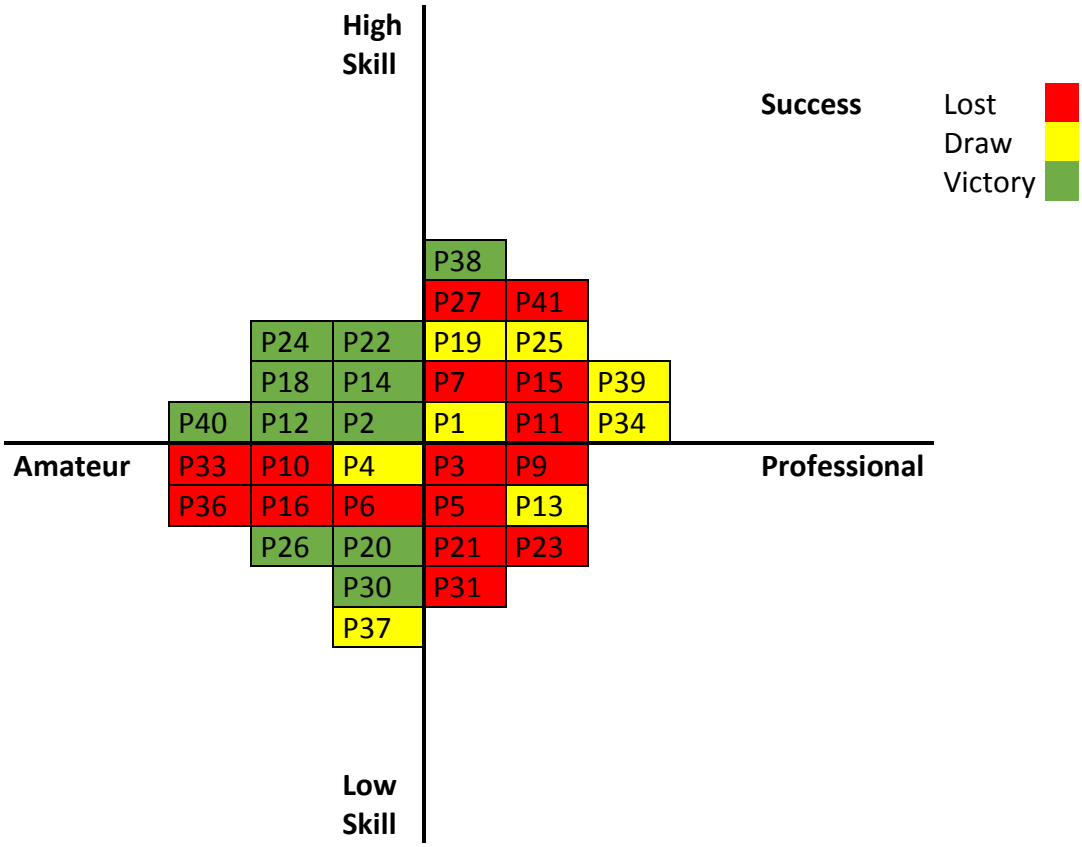

Figure 14 - Relation between skill, difficulty level and success.

Now that the skill groups are formed it is possible to see the results, following the hypothesis order. The first and second hypothesis for this research question are about the GEQ (Game-Experience Questionnaire). The Game-Experience questionnaire was given to the participants in the end of the test. In a scale from 0 to 4 (0-“not at all” and 4-“extremely”), the participants had to say how they felt about the presented item. The test represents seven different components (competence, immersion, flow, tension, challenge, negative affect and positive affect), with each of these components being represented by two items in the questionnaire, which made for a total of 14 items. To access the value for each component, it was necessary to get the mean value of the two directly related items. In the graph below it is possible to see the value for each component, having the skill groups as an independent variable (see table 16, in the appendix).

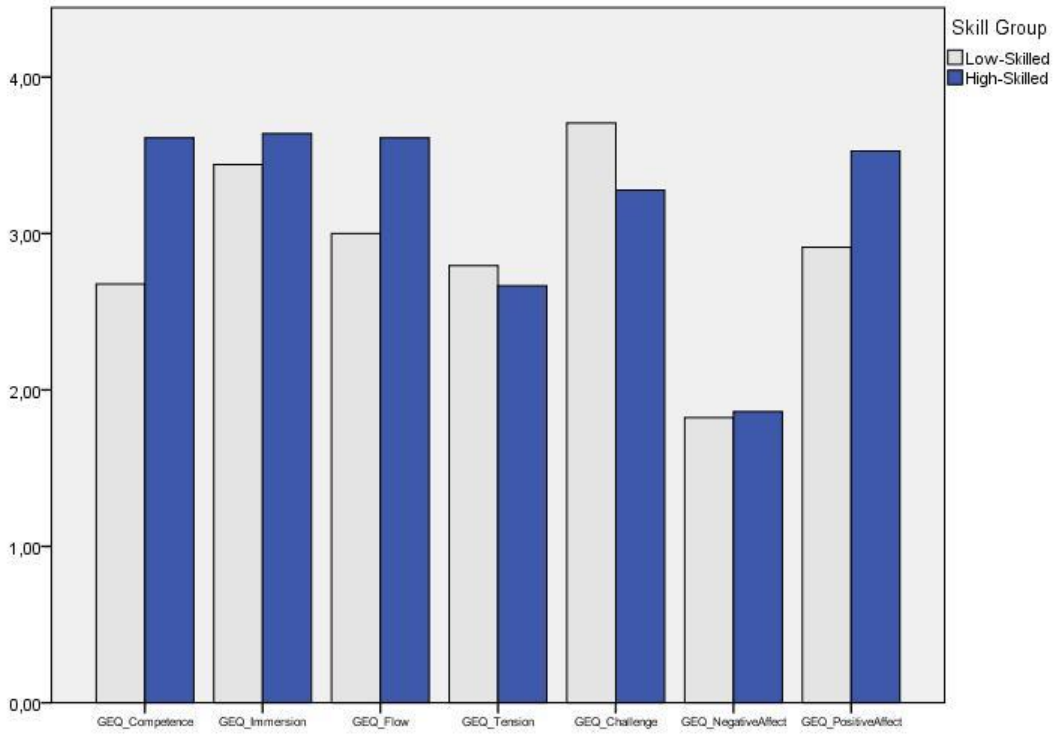

Figure 15 - GEQ values related with skill.

Just by taking a quick look, it is possible to observe that the high-skilled group has best results in the competence, flow and positive affect components of the questionnaire. The low-skilled group also reveals higher results in the challenge component, which makes sense.

Hypothesis 1 says that *"Participants with a high degree of gaming skills will have higher values measured in the competence, positive affect and immersion components of the iGEQ than the participants with low degree of gaming skills".* To test this, I will test the correlation between these variables. The components (competence, positive affect and immersion) work as dependent variables, while the skill group is the independent variable. The following table shows the paired samples correlation results from the t-test paired groups.

		N	Correlation	Sig.
Pair 1	GEQ_Competence & groupsskilled zScores	41	,424	,006
Pair 2	GEQ_Immersion & groupsskilled zScores	41	,135	,398
Pair 3	GEQ_PositiveAffect & groupsskilled zScores	41	,299	,058

Table 5 - Paired samples correlation between the GEQ values and the skill group.

It is possible to observe that there is a positive medium correlation (r=0.424; p=0.006) between the competence and the skill groups, while the immersion component does not correlate at all (r=0.135; p=0.398). The positive affect component has also a low level of significance and a weak positive correlation (r=0.299; p=0.058). Because of this, and despite the positive results in the competence item, the hypothesis 1 is rejected.

In the hypothesis 2, it says that *"Participants with a high degree of gaming skills playing in the professional level will have higher values measured in the flow and challenge components of the iGEQ than the rest of the participants".* This hypothesis is slightly different that the first one, because it introduces another factor, the difficulty level. I will test if the differences between these variables are significant. The flow and challenge components will work as dependent variables, while the skill group and level of difficulty will work as independent variables (see table 17, in the appendix).

By looking at the table it is possible to affirm that the challenge component values have significant differences between the skill groups (p=0.036), level of difficulty (p=0.031) and both of them (p=0.001). Opposed to that, there is the flow component, where is not possible to establish and affirm that there are significant differences between the skill groups (p=0.136), level of difficulty (p=0.146) and both (p=0.232). Given this, it is not possible to confirm the hypothesis 2, despite the positive results obtained in the challenge item. The hypothesis 2 is rejected.

Moving forward to the hypothesis 3, it says that *"participants in the high skill group will have more positive results in the dominance and affective valence variable of the SAM scale than the participants located in the low skill group"*. This brings us to the Self-Assessment Manikin scale, which measures the arousal, pleasure and dominance felt by the inquired person at the given moment, using a pictorial scale. In this case I'm interest in observe which group have more positive results in the dominance and mood variable of the SAM scale after playing the match. I'm also interested in observe if the match have positively or negatively influence those values.

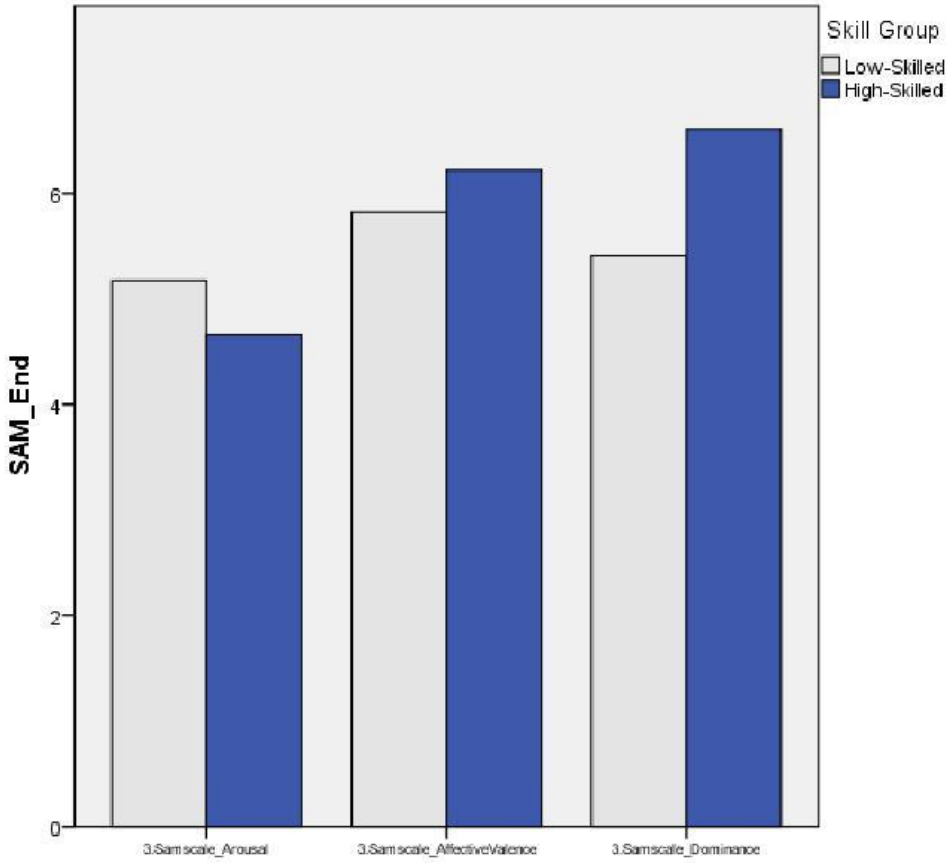

Figure 16 - Self-Assessment Manikin results obtained at the end of the match.

In a first impression, it is possible to see that the players in the high-skill group have better results in the affective valence and in the dominance components of the SAM scale. High skilled players have a mean value of 6.22 (M=6.22; SD=1.63), while the low-skilled group has a mean value of 5.82 (M=5.82; SD=1.43).

In the dominance component, high-skilled players have a mean of 6.61 (M=6.61; SD=2.06), while low-skilled have a mean of 5.41 (M=5.41; SD=2.18) (see table 18). In the next two graphics it is possible to see how the values changed in the mood and dominance components, before and after playing the FIFA match.

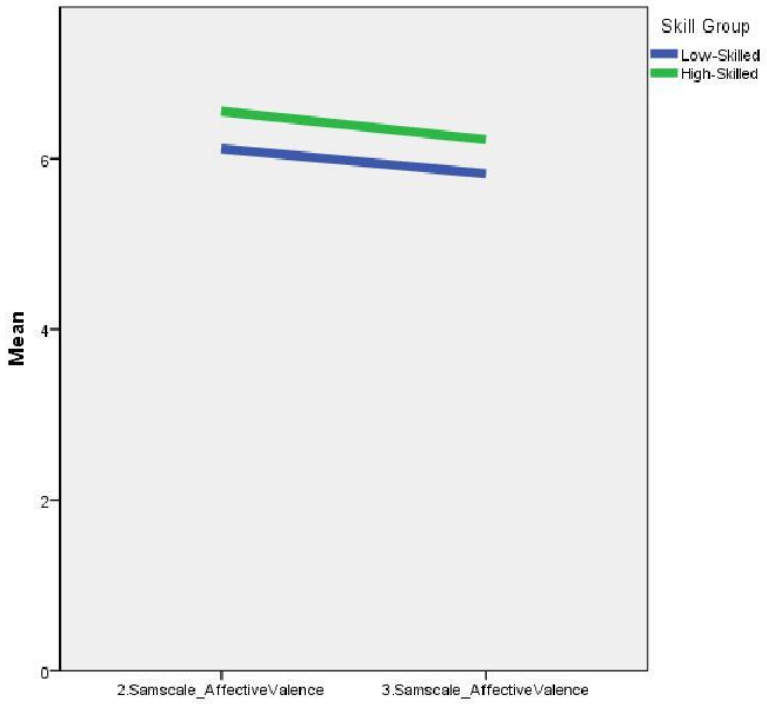

Figure 17 - Self-Assessment Manikin variation (Affective Valence).

By looking at this graphic it is possible to understand that playing the FIFA match had slight negative influence in the mood of the participants, high or low skilled.

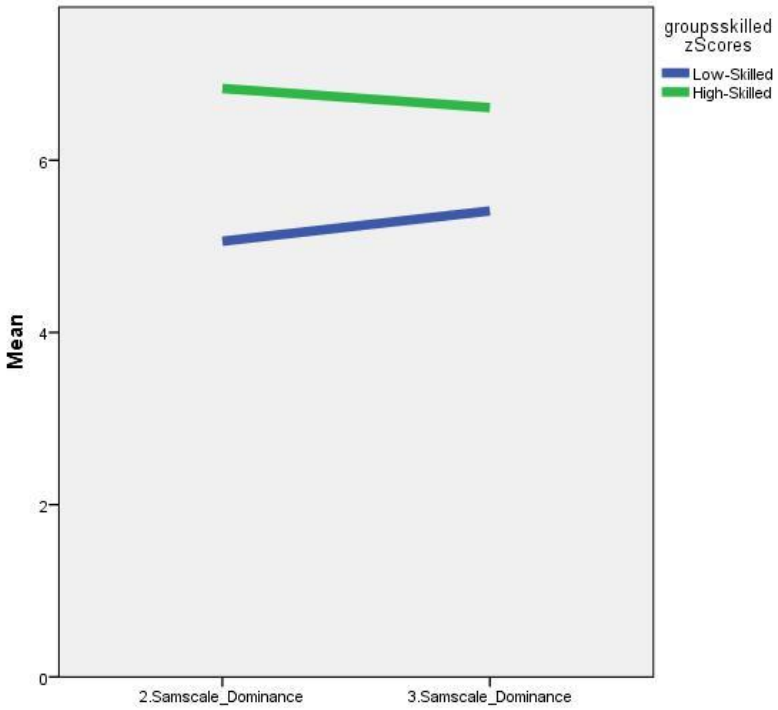

Figure 18 - Self-Assessment Manikin variation (Dominance).

It is interesting to notice that the low skilled players felt more dominant after playing the match, while the high skilled players felt the opposite. Returning to the hypothesis validation, it is not possible to say that the differences are big enough to confirm the hypothesis. The t-test for equality of means results shows that are no significant differences in the values for the affective valence (p=0.446) and dominance (p=0.104). The hypothesis 3 is rejected.

The hypothesis four and five are related with the pupil dilation and the electro dermal (EDA) data collected in the tests. Due to some technical problems that happened during the data collection in the tests, I don't have enough data to test the hypothesis for the whole match. Anyway, I have data for the first half of the match, and that's the data that is going to be analyzed in this section. The data for the pupil dilation is divided in two: left and right eye. I'm going to analyze the mean of the diameter during the first half for both eyes. First I need to see if there is a normal distribution in the data.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Left Eye pupil diameter (mean)	,093	35	,200*	,976	35	,614
Right Eye Pupil Diameter (Mean)	,157	35	,028	,965	35	,316

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 6 - Normality tests for pupil dilation values.

Because I have a small sample (N=35), I will use the information given by the Shapiro-Wilk test, which shows that there is a normal distribution in both eyes (p>0.05). After observing that the data is normal distributed, I can use the mean of the pupil diameter and have it grouped in high and low skilled players.

The next graphic shows the pupil diameter values distribution, according to the skill groups.

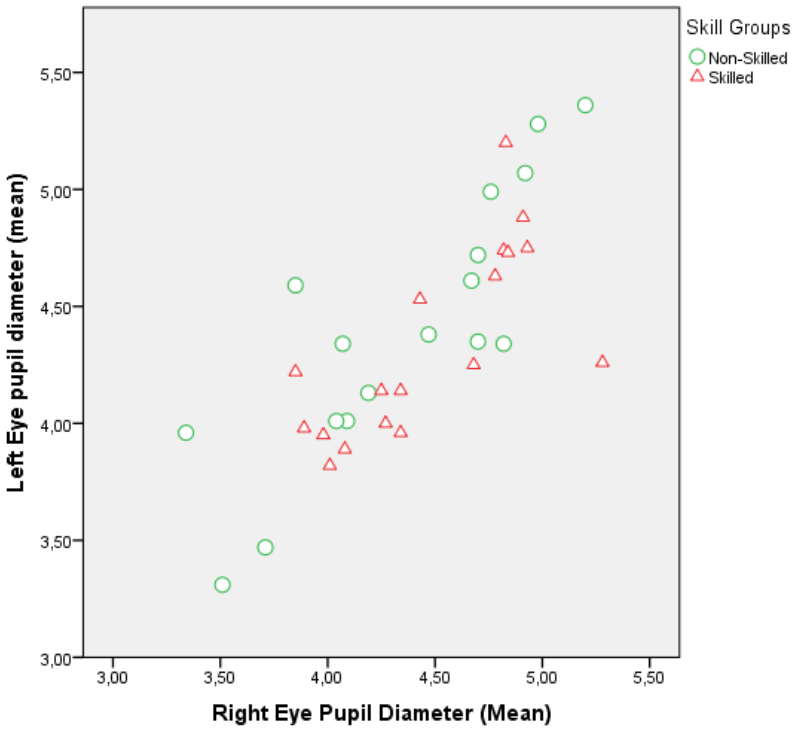

Figure 19 - Mean recorded pupil dilation values vs skill group.

The EDA parameter that was chosen for this analysis is the sum of the amplitudes registered for each participant. In the table below is displayed the normal distribution test result for this parameter.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Sum of amplitudes in mS	,191	28	,011	,813	28	,000

a. Lilliefors Significance Correction

Table 7 - Normality test for EDA values (sum of amplitudes).

As done before with the normality test for the pupil dilation, I use the Shapiro-Wilk test, and in this case I observe that the data is not normal distributed ($p<0.05$).

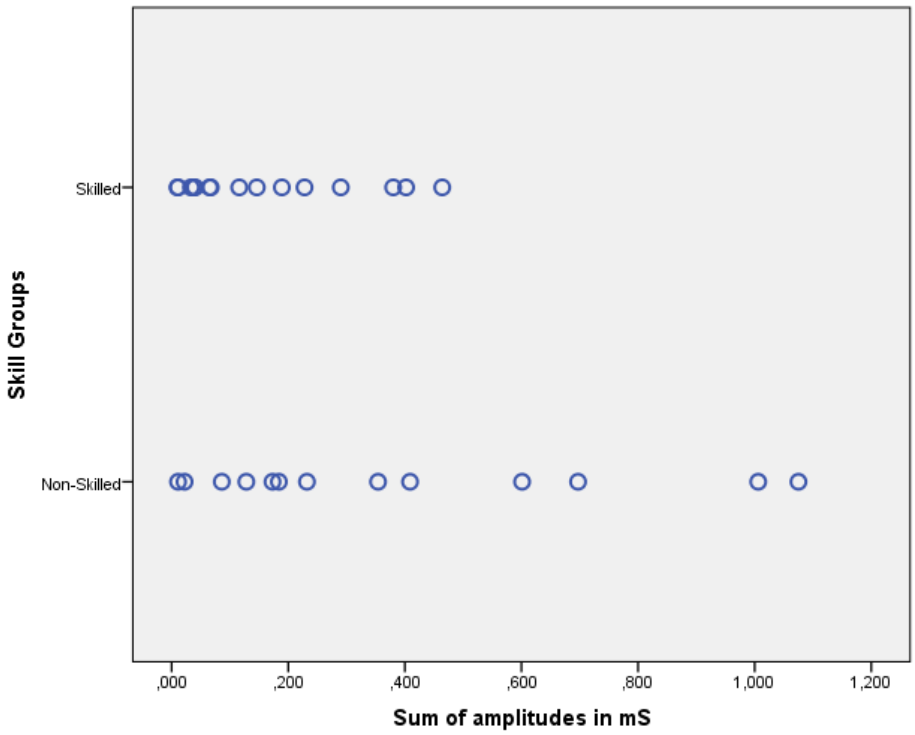

Figure 20 - Recorded EDA values vs skill groups.

In the graphic above it is possible to see the sum of amplitudes distributed according to the participant's skill group. There are some participants that show zero reactions. However we can see that the non-skilled participants have a broader dispersion of results. Returning to the hypothesis, the hypothesis four says that "*Pupil dilation measurements correlate positively with EDA measurements"* (see table 19, in the appendix).

Looking at the table we can clearly see that left and right pupil have an extremely positive correlation (r=0.781; p=0.00). But that doesn't happen between both eyes (pupil diameter mean) and the sum of amplitudes of the EDA measurements, because the significance value is very high, both in with the left eye (r=-0.039; p=0.845) and right eye (r=-0.167; p=0.397). Given this, the hypothesis 4 is rejected.

Moving forward to the hypothesis five, it says that *"Participants placed in different skill groups will produce different measurements (pupil dilation/EDA)"*. I will do a separate analysis, first observing the values for the pupil dilation and later for the EDA values. In the graphic that is presented next, the pupil diameter mean values for each eye are presented and organized according the skill groups.

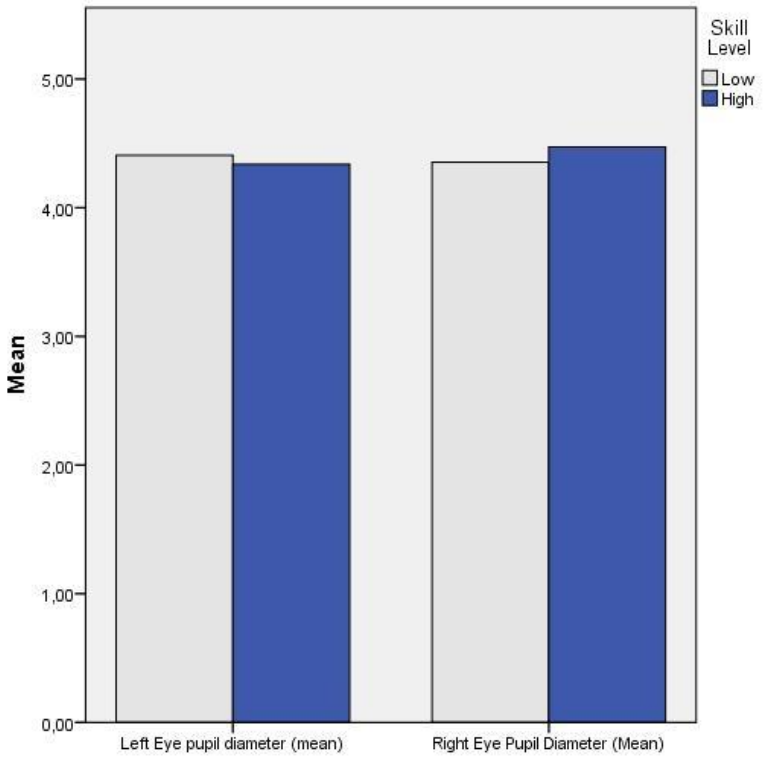

Figure 21 - Mean pupil dilation values recorded in each group, for each eye.

By observing the previous graphic, it is clear that there are no big differences between the pupil dilation values for each group. The average mean value of the pupil dilation in the left eye is 4.41 (M=4.41; SD=0.58) in the low skill group and 4.34 (M=4.34; SD=0.40) in the high skill group. This values are very similar in the right eye, with the mean value being 4.35 (M=4.35; SD=0.55) in the low skill group and 4.47 (M=4.47; SD=0.42) in the high skill group. The values given by the Levene's Test for equality of variances are 1.099 (p=0.302) for the left eye and 2.074 (p=0.159). These values are not different enough for me to affirm that the skill group works as an influent factor for different pupil dilation measurements (see table 20, in the appendix).

Concerning the sum of the amplitudes (mS), there is a considerable difference in the variances between groups. In the next graphic are represented the mean values of the sum of amplitudes, organized by the skill group.

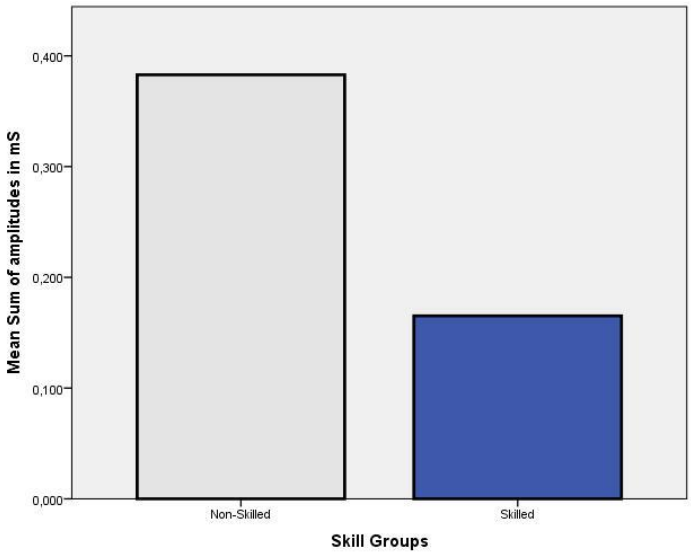

Figure 22 - Mean of the sum of amplitudes values (mS) recorded in each group.

The mean value of the sum of amplitudes (mS) for the low skill group is 0.38 (M=0.38; SD=0.36) while the mean for the high skill group is 0.17 (M=0.17; SD= 0.15). The Levene's test for equality of variances shows that there are relevant differences between groups (p=0.007). The participants that didn't have any reaction and by consequence got zero in their sum of amplitudes were also counted in the calculation of the mean values (see table 21, in the appendix).

Concluding, I can't confirm the hypothesis 5 because it implied that both pupil dilation and EDA values would be different according to the skill groups. However I just observed that behaviour in the EDA values. The hypothesis 5 is rejected.

The sixth hypothesis is more focused on the gaze behavior of the participants in an element of the game interface: the minimap. It says that *"Higher skilled players will have more fixations in the minimap"*. The data to be analyzed is divided in three interesting components, all concerning fixations: Fixation Count (FC), Fixation Duration (FD) and Total Fixation Duration (TFD). Firstly I need to see if these three components are correlated with each other (see table 22, in the appendix).

Assuming that the "FD_Minimap_N" is the Fixation Count, we can clearly see that there is a strong correlation (r=1.000) between the FC and the TFD, with the significance level being 0.00 (p< 0.05). On the other hand, the correlation is very weak between FC (r=0.056) and TFD (r=0.079) with the FD. It is possible to say that there is no correlation between these components.

Starting with the number of fixations on the minimap, the average number of fixations of the participants placed in the low skill group is 25.24 (M=25.24; SD=20.42), which is slightly less than the participants placed in the high skill group (M=27.89; SD=27.53). The Levene's test tells that this difference is not big enough to be considered (p=0.351).

Concerning the duration of the fixations, the average time that a fixation lasts in the low skill participants is 0.24 seconds (M=0.24; SD=0.06), while in the high skill participants is 0.25 seconds (M=0.24; SD=0.05). The Levene's test also tells that this difference is not significant (p=0.973).

The last component to be analysed, which is the total duration of the fixations, the average for the low skill group is 6.27 seconds (M=6.27; SD=5.23) while in the high skill group is 7.25 seconds (M=7.25; SD=7.67). There is a slight difference, that failed the significance level (p=0.341). Given this, the hypothesis 6 is rejected.

3.3.3. Research Question 2 –
Does an explicit strategy for penalty kicks influence the gaze behavior and the performance of the player during the penalty kick?

This research question focus on the adoption of a penalty kicking strategy by the player, and how that influences the gazing behavior of the participants while shooting a determined number of penalties in-game. Before the participants played the penalty challenged, they were asked about this issue in the questionnaire, with three possible answers: goalkeeper dependent strategy, goalkeeper independent strategy and no strategy. The results were a bit unbalanced with only 4.9% (N=2) of the participants assuming a goalkeeper dependent strategy, while 53.7% (N=22) declared to have a goalkeeper independent strategy. The 41.5% (N=17) remaining didn't specify their penalty kicking strategy. In the test design, I opted to divide the penalty graphic interface in seven different zones: ball, goal, goalkeeper, name of the player, besides the goal, player and power bar.

The hypothesis 1 says that *"Participants that declared to have a goalkeeper dependent penalty kicking strategy show a gazing behavior that is more focused on the goalkeeper than gamers without such strategy"*. Like in the hypothesis 6 of the research question 1, the data to be analyzed is divided in three components, all concerning fixations: Fixation Count (FC), Fixation Duration (FD) and Total Fixation Duration (TFD) (see table 23, in the appendix).

These three components are all correlated with each other, since the significance level existent between them is always low ($p<0.05$). It may be hard to statistically support the hypothesis 1 because there were only 2 people that declared to have a goalkeeper dependent strategy. Anyway, I proceeded with the tests, and the results say that atleast in the FD ($p.=0.002$) and TFD ($p=0.004$) there do exist significant differences in the data collected between the participants with different penalty kicking strategies. (check table 23, in the appendix).

The hypothesis two says that *"Participants that declared to use a goalkeeper independent strategy are more successful than gamers without such strategy"*. In this case I think it is

best to rule out the two participants that have declared to have a goalkeeper dependent strategy, since they may influence the results. In the graphic below it is possible to see that the participants who declared a goalkeeper independent strategy weren't more successful than those without a strategy.

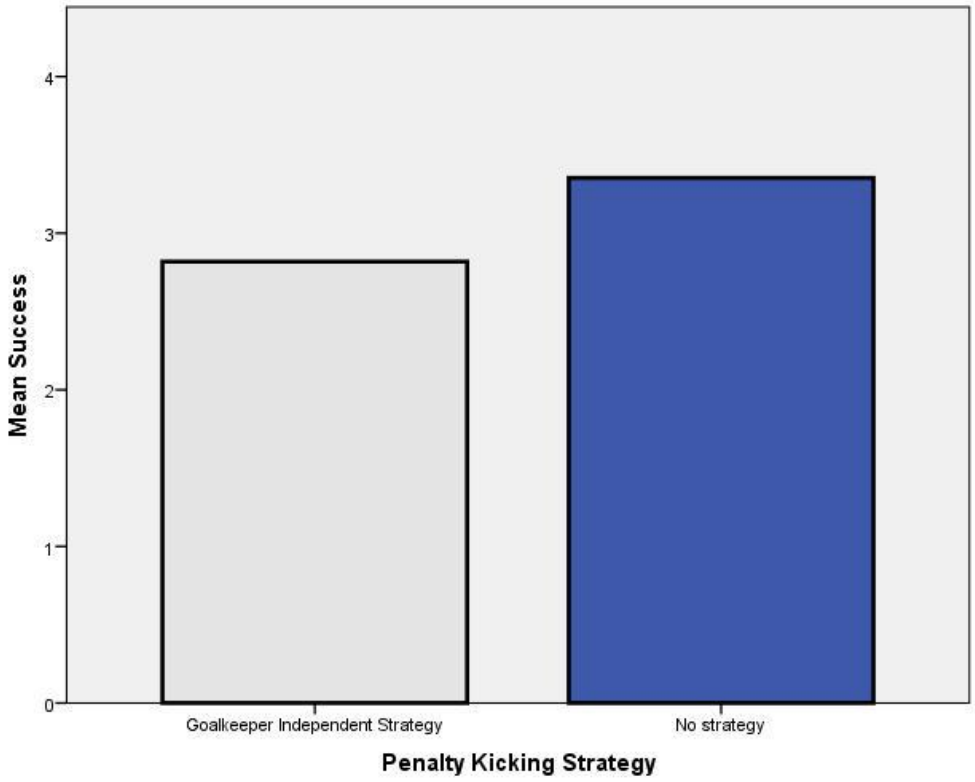

Figure 23 - Penalty kicking strategy and success.

As said before, 53.7% (N=22) of the participants assumed to prefer a goalkeeper independent strategy when shooting a penalty kick, while 41.5% (N=17) didn't have a specific preference on how to shoot their penalties. To do this analysis I used the independent samples T-test, using the penalty kicking strategy as an independent variable, and the success as a dependent variable.

The participants that choose a goalkeeper independent strategy have an average mean value of 2.82 with a 1.68 standard deviation (M=2.82; SD=1.68), while the participants that declared not to have any strategy showed an average mean of 3.35 and a standard deviation of 0.931 (M=3.35; SD=0.931) (see table 24, in the appendix). By looking at these

numbers it is possible to reject the hypothesis two, since the participants who declared to have a goalkeeper independent strategy have a lower mean value for the number of penalties scored than the people that don't assume any strategy. Also it is possible to observe that the goalkeeper independent participants have more dispersed values in the success variable, which is not a positive indicator when trying to assume the goalkeeper independent strategy as an influent factor towards success (and by success I mean the number of penalties scored).

3.3.4. Research Question 3 – The brand placement in the goal nets is recognized and remembered by the players?

This question is focused on brand placements inside videogames and if they are recognized and remembered by the players. In the case of this study I am exploring a football simulator, FIFA14, and there are several places inside the game interface that are fit to place brand logos. One that triggered my interest is the goal net, which has an interesting area to proceed with brand placement. Further it is located in a privileged spot – the goal. In FIFA 14 there are no brand placements in the goal net during the match, but in the practice arena feature there is an Adidas brand placement in the net. So I got the opportunity to test if this brand placement is effective and if the message is well communicated to the participants. The participants were exposed to the stimuli during the penalty kick challenge. In the questionnaire that was delivered to the participants in the end of the test there were some questions regarding this topic.

The first question asked if the participants had recognized one or more brand placements while playing. All of the test participants answered to this question (N=41). 31.7% (N=13) answered yes, 43.9% (N=18) said that they didn't saw any brand placement inside the game and the 24.4% (N=10) remaining participants were not sure if they saw any brand placement (see table 25, in the appendix). Out of those who answered yes, I further asked who was the sender of the message (which brand or brands did they recognize).

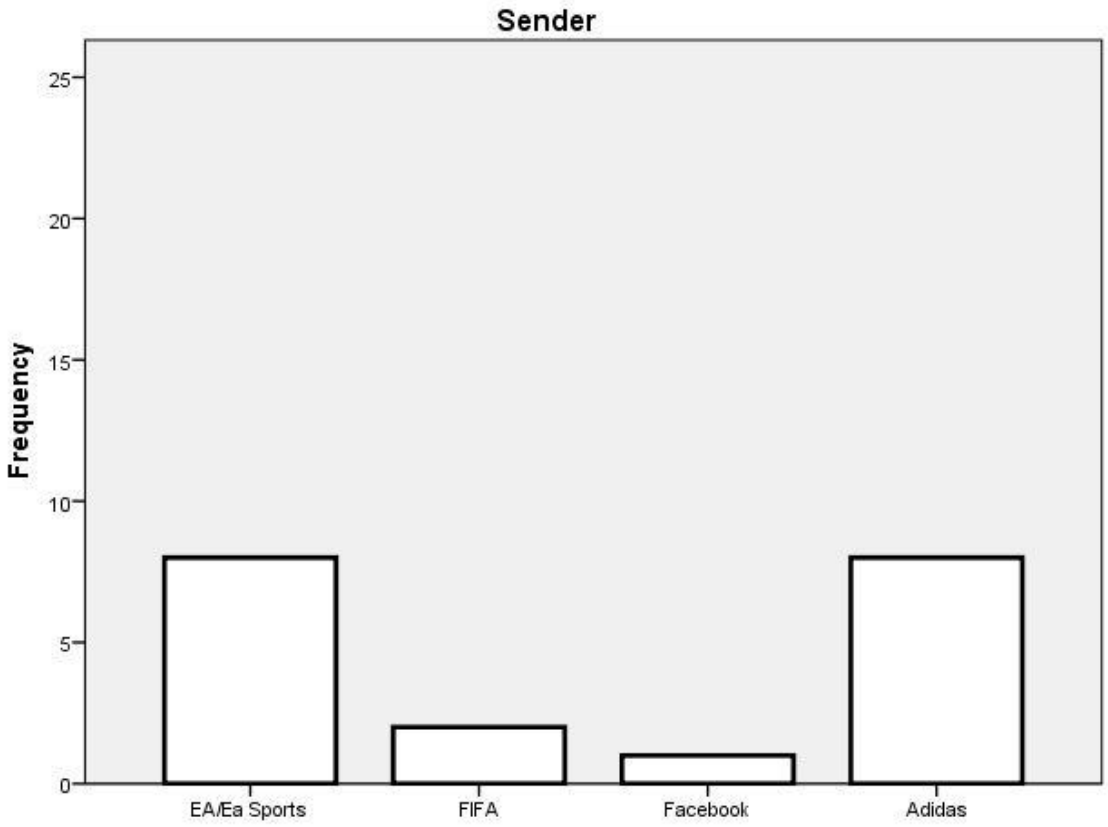

Figure 24 - Brands participants saw in the game.

Some participants answered that they recognized more than one brand. The Adidas and EA brands were the most noticed by the players, being referenced 8 times each.

I also want to know where the participants saw the brands they identified. The participants were asked in which element of the game they saw brand placements. Most of the participants (N=13) affirmed that they saw the brand placements on the side banner that surrounds the field. Then there are some different answers like shoes (N=2), ball (N=1), player (N=1), goal net (N=2) and field (N=1).

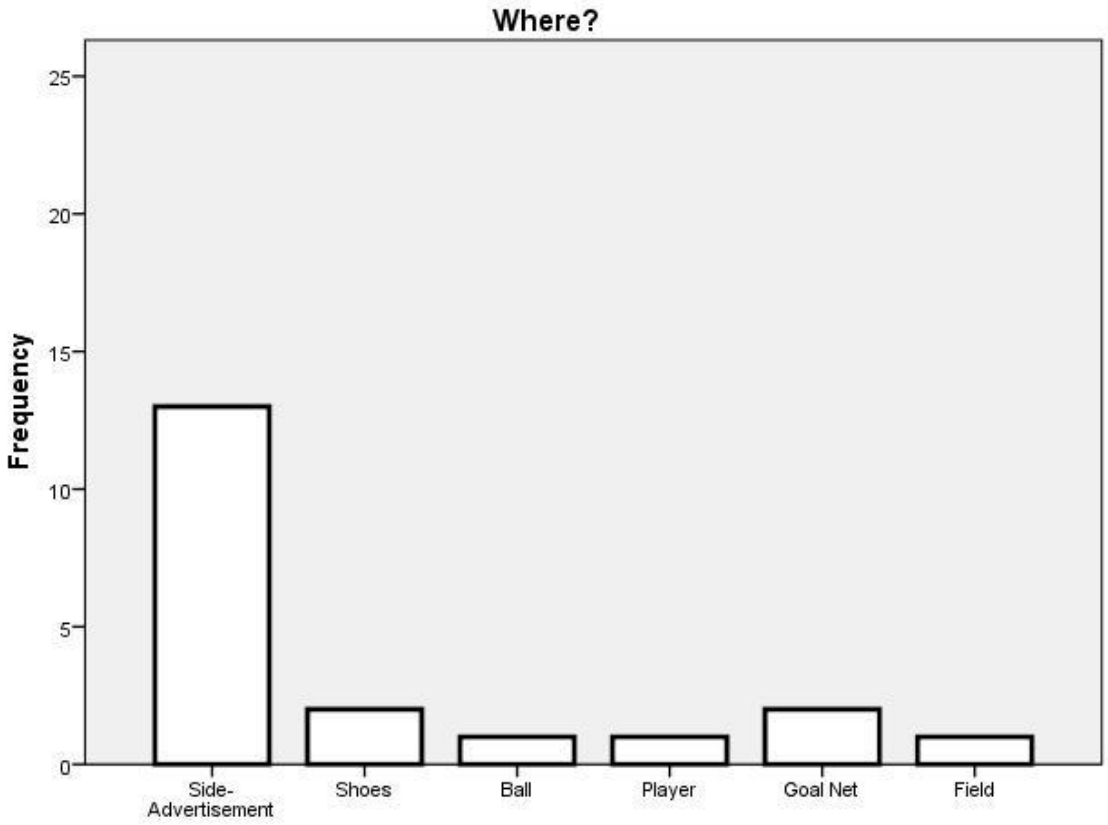

Figure 25 - Places where participants saw brand placements.

Concerning the participant's opinion about brand placements inside games, I thought it would be interesting to know if they are positive, neutral or negative about it. Every participant answered to this question (N=41). 41.5% (N=17) have a positive attitude towards brand placement inside videogames, while 51.5% (N=21) have a neutral position. None of the participants declared a negative attitude, and 7.3% (N=3) were not sure (see table 26, in the appendix).

It is time to focus on the hypothesis 1, which says that "*The number of participants that recognize and remember the brand placement will be >50% of the total number of participants*". To know if this is true, I have placed two questions in the questionnaire. The first was to see if the participant has noticed any brand placement in the goal net, during the penalty kicks. Unlike what was expected, only 24.5% (N=9) of the participants that answered to this question affirmed to have noticed a brand placement in the goal net.

75.7% (N=28) of the participants that answered to the question didn't noticed any brand on the goal net, despite it was placed on a privileged spot, in the middle of the screen (see table 27, in the appendix). This may be because the participants were engaged in a cognitive task that diverted their attention away from the brand placement.

I also asked the participants that answered "yes" in the previous question (N=9), about which brand they did see in the goal net. Most of the participants that answered yes in the previous question identified the correct brand (N=6; 66.6%), which was Adidas. Anyway there were still some participants that declared to have seen brands that were not present there, like FIFA (N=2; 22.2%) and EA (N=1; 11.1%).

The hypothesis 1 for this research question was rejected, since only 6 participants (14.63%) out of the total of 41 were able to recognize and remember the brand placement in the goal net.

4. Discussion and Conclusions

4.1. Final Comments

After reaching this phase of the project, it is relevant to look back and remember which were the proposed goals for this research. The main goal was to identify relations between the tested participants skill level and their experience with the object of study. To achieve this goal it was necessary to design, develop and implement a methodology to collect relevant data to get access to the participants gaming experience and to form groups based on their skill level. Due to the problem that those experiences can be beneath the level of consciousness, the recorded data must reflect conscious answers or behavior as well as unconscious. Additionally I wanted to understand if some methodological overt and covert responses are intercorrelated with in-game performance, and also understand if the participants recognize and remember an in-game brand placement.

The tests were held up in a controlled environment, that was designed to ensure the most neutral influence on the participant which, in my opinion, was very positive for collecting 'non-contaminated' by willful processes data instead of spontaneous data.

For this research I have three research questions. The first one is related with the main goal of the dissertation: "*Are gaming skills a moderator for gaming experience?*". I designed a method to access the participants skill level, and with that I was able to classify them according to their skills. This method is one of the key features in this investigation, since it makes possible to form skill groups for further comparison. I believe that the method was effective and provided solid skill groups. One aspect that corroborates this affirmation is the iGEQ competence item that shows significant differences between the skill groups ($r=0.424$; $p=0.006$). The high skill participants also had better results in the self-assessment manikin dominance item than the low skilled one's (see figure 16). Competence and dominance are characteristics more related with high proficiency towards a determined task/activity.

The literature review showed me that there are aspects that can be explored in order to access gaming experience. These aspects include concepts like presence, flow, immersion, engagement, attention and arousal, which were detailed in the literature review chapter.

Concerning arousal, I detected an interesting pattern. The low skilled participants revealed to have considerable differences in the arousal indicators than the high skilled ones. They had significantly higher scores in the challenge item of the iGEQ and in the arousal item of the self-assessment manikin test. Adding to this, the EDA measurements revealed a considerable difference between skill groups. Given this, I consider that it is possible to assume that less proficient players will feel more aroused playing a videogame than more skilled ones.

However, being more aroused does not mean that a determined player is having a positive or enjoyable experience. This enjoyable experience may be related with the concept of fun, which can be considered a "special intrinsic satisfaction" offered by the game to the player (McCarthy et al. 2005). Read and MacFarlane (2000) and Dix (2005) affirm that the concept of fun is related with engagement, which can also be related with concepts like flow, presence or immersion.

After analyzing the results, the gaming experience differences between skill groups were not very clear. High skilled participants had higher values measured in the immersion and flow items of the iGEQ. The differences were not big enough to assume anything. I was expecting to use the pupil dilation values to conclude something, but the values measured were very similar between the skill groups.

Despite this, and by looking to some of the questionnaire results, I noticed another interesting pattern. High skilled participants revealed to have a more positive experience in the test than the low skilled participants. My observation is based on the positive affect item of the iGEQ, that show's a significant difference between the skill groups. Adding to this, the self-assessment manikin values measured for the affective valence item are also superior in the high skilled participants. Given this, I believe that the experience may be more pleasant for someone that is more proficient with the game.

The second research question "*Does a penalty kicking strategy influence the gaze behavior and the performance of the player during the penalty kick?*" focus is to understand if players that claim to have a defined penalty kicking strategy demonstrate it in their gaze behavior. There were three different penalty kicking strategies available. Unfortunately I wasn't able to do a proper comparison between the goalkeeper dependent and independent strategy. The reason for this was the lack of participants that admitted to have a goalkeeper dependent strategy.

The third research question "*The brand placement in the goal nets is recognized and remembered by the players?"* aim is to know the potential of a brand placement in the goal nets of FIFA14. The stimuli was presented while the participant was undertaking the penalty kick challenge. After analyzing the results I understood that the brand placement was not very effective, in this specific case. I think that this negative result was a result of the participant's focus on the task, which 'blinded' most of them. I believe that the brand placement would be more effective if placed in areas or moments where the player doesn't have to put much cognitive effort in any determined task.

It may also be interesting to look at the hypothesis results (check table 28, in the appendix). The hypothesis results are not very positive, but I think this happened because the analysis turned out to be more complex than I initially supposed. There are factors that intervene and influence the collected data.

4.2. Limitations of the Study

In an overall view, I consider that this research project was well driven and I'm satisfied with it. However there were some aspects that could have been improved.

Concerning the number of participants, my initial aim was to test 60 individuals, but in the end I had 41 participants. 41 participants is not bad, but 60 would be a more interesting number. For example, the hypothesis 1 of the research question 2 was not tested because

I didn't have enough participants saying that they had a goalkeeper dependent strategy. As I mentioned before in this document, the testing phase was held up in Cologne during the month of March. My tests coincided with the holidays break for the students of the institute, which made it harder to gather participants. It is not possible to generalize the results to all the FIFA14 players, since I had a limited number of participants and they played a specific videogame (FIFA14).

Concerning the tests, one problem occurred with handling one of the instruments of data collection. In the first tests I wasn't using the varioport in the correct way, which made me lose the measurements for the second half of the FIFA match of those tested participants. I just noticed the mistake when I already had tested a considerable number of participants, and I had to assume the error and just use the measurements of the first half of the test.

4.3. Future Work Perspectives

Accessing the gaming experience of players is a complex task, that may be influenced by different variables. The psychological concepts are also complex, and it is not easy to setup a framework that objectively interprets the indicators.

There is still work to be done in properly combine different human responses measurements, for more objective results. The gaming experience area of study will benefit if future research combines different indicators of psychological aspects in a more thorough way.

Further I think that in a commercial POV, there is real potential in including brands inside the games. With the help of *Eye-Tracking* technology it is easy to know if a brand placement is being acknowledged by the players. However this doesn't mean that the information is being cognitively processed. It is possible that a mix of different methods (overt/covert, conscious/unconscious) may provide more sophisticated insights about in-game advertising. On the other hand, this topic must be handled carefully, since not every game is adequate to have brand placements. Everything must be done in context. For example,

in this dissertation, participants were asked about their attitude towards brand placement inside games, and the answers were positive. I believe that the answers were positive because they had just played a game that is natural to have brand placements. I don't believe they would have the same opinion if they found a modern brand placement while playing a medieval RPG.

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Appendix

Tables

Table 8 - Summary of game definitions

Johan Huizinga (1950)	Free Activity Play is not “ordinary” or “real life” Play is distinct from “ordinary” life both as locality and duration Fixed Rules and order No material interest, no profit to earned
Roger Caillois (1961)	Free activity Separate in time and space Uncertain Unproductive Rules Make-Believe
Bernard Suits (1978)	Engage Activities directed towards a specific state of affair Rules (allow the game to happen)
Avedon & Sutton Smith (1971)	Voluntary Opposition between forces Procedures and rules Produce outcome
Chris Crawford (1981)	Representation Interaction Conflict Safety
Katie Salen & Eric Zimmerman (2003)	Rules Variable, quantifiable outcome Value assigned to possible outcomes Player effort Player attached to possible outcomes Negotiable consequences

Table 9 - Nielsen's Heuristics (from: http://nngroup.com/articles/ten-usability-heuristics/)

Nielsen's Heuristics	
ID	**Definition**
N1	Visibility of system status
N2	Match between system and the real world
N3	User control and freedom
N4	Consistency and standards
N5	Error prevention
N6	Recognition rather than recall
N7	Flexibility and efficiency of use
N8	Aesthetic and minimalist design
N9	Help users recognize, diagnose, and recover from errors
N10	Help and documentation

Table 10 - Federoff Heuristics (Federoff, 2002)

Game Interface	Controls should be customizable and default to industry standard settings
Game Interface	Controls should be intuitive and mapped in a natural way
Game Interface	Minimize control options
Game Interface	The interface should be as non-intrusive as possible
Game Interface	For PC games, consider hiding the main computer interface during game play
Game Interface	A player should always be able to identify their score/status in the game
Game Interface	Follow the trends set by the gaming community to shorten the learning curve
Game Interface	Interfaces should be consistent in control, color, typography, and dialog design

Game Interface	Minimize the menu layers of an interface
Game Interface	Use sound to provide meaningful feedback
Game Interface	Do not expect the user to read a manual
Game Interface *(Added)*	Provide means for error prevention and recovery through the use of warning messages
Game Interface *(Added)*	Players should be able to save games in different states
Game Interface and Play	Art should speak to its function
Game Mechanics	Mechanisms should feel natural and have correct weight and momentum
Game Mechanics	Feedback should be given immediately to display user control
Game Mechanics and Play	Get the player involved quickly and easily
Game Play	There should be a clear overriding goal of the game presented early
Game Play	There should be variable difficulty level
Game Play	There should be multiple goals on each level
Game Play	"A good game should be easy to learn and hard to master" (Nolan Bushnell)
Game Play	The game should have an unexpected outcome
Game Play	Artificial intelligence should be reasonable yet unpredictable
Game Play	Game play should be balanced so that there is no definite way to win
Game Play	Play should be fair
Game Play	The game should give hints, but not too many
Game Play	The game should give rewards
Game Play	Pace the game to apply pressure to, but not frustrate the player
Game Play	Provide an interesting and absorbing tutorial
Game Play	Allow players to build content
Game Play	Make the game replayable
Game Play	Create a great storyline
Game Play	There must not be any single optimal winning strategy
Game Play	Should use visual and audio effects to arouse interest

Game Play	Include a lot of interactive props for the player to interact with
Game Play	Teach skills early that you expect the player to use later
Game Play	Design for multiple paths through the game
Game Play	One reward of playing should be the acquisition of skill
Game Play	Build as though the world is going on whether your character is there or not
Game Play	If the game cannot be modeless, it should feel modeless to the player

Table 11 - Koeffel Heuristics

	No.	Heuristic	Source
Game play / Game story	1	The player should be presented with "clear goals" early enough or be able to create his own goals and "should be able to understand and identify them". There can be "multiple goals on each level", so that there are more strategies to win. Furthermore, the player should know how to reach the goal without getting stuck.	(Federofff 2002; Desurvire et al. 2004; Koivisto and Korhonen 2006; Schaffer 2007)
	2	The player should receive meaningful rewards. "The acquisition of skills" could also be a reward.	(Federofff 2002; Koivisto and Korhonen 2006)
	3	The player should "feel that he is in control". That includes the "control over the character" as well as the "impact onto the game world". "The controls should also allow management that is appropriate to the challenge"."Changes the player makes to the game world should be persistent and noticeable". Furthermore, the player should be able to "respond to threats and opportunities".	(Desurvire et al. 2004; Koivisto and Korhonen 2006; Schaffer 2007; Pinelle et al. 2008)
	4	„Challenge, strategy and pace should be in balance". "Challenges should be positive game experiences".	(Desurvire et al. 2004; Koivisto and Korhonen 2006)
	5	„The first-time experience is encouraging".	(Koivisto and Korhonen 2006)

	6	The „meaningful game story should support the game play“and be „discovered as part of the game play.“	(Desurvire et al. 2004; Koivisto and Korhonen 2006)
	7	„The game does not stagnate“ and the player feels the progress.	(Koivisto and Korhonen 2006; Schaffer 2007)
	8	The game should be consistent and „respond to the user's action in a predictable manner“. This includes “consistency between the game elements and the overarching settings as well as the story”. The story should “suspend disbelief” and be perceived as a single vision, i.e. the story should be planned through to the end.	(Desurvire et al. 2004; Koivisto and Korhonen 2006; Pinelle et al. 2008)
	9	„It should be clear what's happening in the game, the plauer should understand failure conditions and be given space for making mistakes“.	(Schaffer 2007)
	10	„There should be variable difficulty levels” for a „greater challenge“. It should be “easy to learn, but hard to master”.	(Federofff 2002; Desurvire et al. 2004; Pinelle et al. 2008)
	11	The game and the outcome should be perceived as being fair.	(Federofff 2002; Desurvire et al. 2004)
	12	The game itself should be replayable and the player should enjoy playing it. Nevertheless “challenging tasks should not be required to be completed more than once”. The challenge should create the desire to play more. This includes also the possibility to skip non-playable and repeating content if not required by the game play.	(Desurvire et al. 2004; Schaffer 2007; Pinelle et al. 2008)
	13	“The artificial intelligence should be reasonable”, “visible to the player, consistent with the player's expectations” and “yet unpredictable”	(Federofff 2002; Desurvire et al. 2004; Röcker and Haar 2006; Pinelle et al. 2008)
	14	The game should be “paced to apply pressure to but not frustrate the player.”	(Federofff 2002; Desurvire et al. 2004)
	15	The “learning curve should be shortened”. The “user's expectations should be met” and the player should have “enough information to get immediately started”. Tutorials and adjustable levels should be able to involve the player quickly and provided upon request throughout the entire game.	(Federofff 2002; Desurvire et al. 2004; Röcker and Haar 2006; Schaffer 2007; Pinelle et al. 2008)

	16	"The game emotionally transports the player into a level of personal involvement (e.g. scare, threat, thrill, reward, punishment)".	(Desurvire et al. 2004)
	17	"The game play should not require the player to fulfil boring tasks".	(Koivisto and Korhonen 2006)
	18	"The game mechanics should feel natural and have correct weight and momentum". Furthermore they should be appropriate for the situation the user is facing.	(Federofff 2002; Pinelle et al. 2008)

Table 12 - Results to the question "How skilled do you think you are?"

HowSkilledFifa

N	Valid	41
	Missing	0
Mean		8,51
Median		9,00
Std. Deviation		1,705
Variance		2,906

HowSkilledFifa

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	2,4	2,4	2,4
	4	1	2,4	2,4	4,9
	6	3	7,3	7,3	12,2
	7	4	9,8	9,8	22,0
	8	7	17,1	17,1	39,0
	9	10	24,4	24,4	63,4
	10	15	36,6	36,6	100,0
	Total	41	100,0	100,0	

Table 13 - Scores in the in-game challenges

Participant_ID	Score SP1	Score SP2	Penalty (Goal)
P01	5900	9084	3
P02	1180	3554	5
P03	780	2088	3
P04	1816	1928	3
P05	0	2680	3
P06	2420	2536	0
P07	11660	10584	1
P08	4780	2560	3
P09	1440	1926	3
P10	0	2532	3
P11	4895	1960	4
P12	4240	5373	4
P13	1760	2156	4
P14	380	2905	1
P15	3660	3623	4
P16	1160	4871	4
P17	3040	2107	4
P18	6620	2242	4
P19	5938	1013	4
P20	1460	989	2
P21	0	3769	0
P22	5998	12038	5
P23	2280	2026	3
P24	1380	3545	3
P25	5000	2742	5
P26	3940	2036	3
P27	1600	1252	2
P28	3920	2311	5
P29	1280	4748	3
P30	200	1580	0
P31	1640	3301	3
P32	2800	2094	4
P33	2480	1519	2
P34	3240	2185	4
P35	2200	3780	3
P36	640	2195	5
P37	880	813	1

P38	4600	6006	3
P39	2400	2147	5
P40	0	6561	4
P41	3897	8798	2

Table 14 - Z standardized values

Participant_ID	Score SP1	Score SP2	Penalty (Goal)	How often	How skilled
P01	1,33075	2,16418	-0,07004	-0,79672	0,28615
P02	-0,67497	0,03343	1,36579	0,75688	0,87275
P03	-0,84495	-0,53143	-0,07004	MISSING	0,87275
P04	-0,40471	-0,59308	-0,07004	-0,79672	-0,88706
P05	-1,1764	-0,30333	-0,07004	-0,79672	-0,30046
P06	-0,14805	-0,35881	-2,22378	-0,79672	-0,30046
P07	3,77842	2,74214	-1,50587	0,75688	0,87275
P08	0,85482	-0,34957	-0,07004	-0,79672	-0,30046
P09	-0,56449	-0,59385	-0,07004	-0,79672	0,87275
P10	-1,1764	-0,36036	-0,07004	MISSING	-2,64687
P11	0,90369	-0,58075	0,64787	0,75688	0,28615
P12	0,62535	0,7343	0,64787	-0,79672	0,87275
P13	-0,42851	-0,50523	0,64787	-0,79672	-0,88706
P14	-1,01493	-0,21664	-1,50587	0,75688	0,87275
P15	0,37888	0,06001	0,64787	0,75688	0,28615
P16	-0,68347	0,54088	0,64787	-0,79672	-0,30046
P17	0,11542	-0,52411	0,64787	0,75688	-0,30046
P18	1,63671	-0,4721	0,64787	0,75688	-0,30046
P19	1,3469	-0,94564	0,64787	0,75688	0,87275
P20	-0,55599	-0,95488	-0,78795	-0,79672	-1,47366
P21	-1,1764	0,11627	-2,22378	-0,79672	-0,88706
P22	1,3724	3,30237	1,36579	2,31049	0,28615
P23	-0,20754	-0,55532	-0,07004	-0,79672	0,28615
P24	-0,58999	0,02996	-0,07004	2,31049	0,28615
P25	0,9483	-0,27944	1,36579	0,75688	0,87275
P26	0,49787	-0,55147	-0,07004	-0,79672	-1,47366
P27	-0,4965	-0,85355	-0,78795	0,75688	0,87275
P28	0,48937	-0,44551	1,36579	-0,79672	0,28615
P29	-0,63248	0,49348	-0,07004	-0,79672	0,28615
P30	-1,09142	-0,72717	-2,22378	-0,79672	-1,47366
P31	-0,4795	-0,06405	-0,07004	-0,79672	-0,30046
P32	0,01343	-0,52912	0,64787	-0,79672	0,87275

P33	-0,12255	-0,75067	-0,78795	-0,79672	-0,88706
P34	0,20041	-0,49406	0,64787	0,75688	0,87275
P35	-0,24153	0,12051	-0,07004	-0,79672	0,28615
P36	-0,90444	-0,4902	1,36579	-0,79672	-3,23347
P37	-0,80246	-1,0227	-1,50587	-0,79672	0,87275
P38	0,77833	0,9782	-0,07004	2,31049	0,87275
P39	-0,15654	-0,5087	1,36579	0,75688	0,87275
P40	-1,1764	1,19205	0,64787	0,75688	0,87275
P41	0,47959	2,05398	-0,78795	0,75688	0,28615

Table 15 - Mz, skill groups, level of difficulty and success

Participant_ID	Mz	Skill Group	Difficulty Level	Success
P01	0,75	High-Skilled	Professional	Draw
P02	0,25	High-Skilled	Amateur	Victory
P03	-0,17	Low-Skilled	Professional	Lost
P04	-0,67	Low-Skilled	Amateur	Draw
P05	-0,64	Low-Skilled	Professional	Lost
P06	-0,4	Low-Skilled	Amateur	Lost
P07	2,04	High-Skilled	Professional	Lost
P08	-0,15	Medium-Skilled	Amateur	Lost
P09	-0,27	Low-Skilled	Professional	Lost
P10	-1,39	Low-Skilled	Amateur	Lost
P11	0,34	High-Skilled	Professional	Lost
P12	0,36	High-Skilled	Amateur	Victory
P13	-0,65	Low-Skilled	Professional	Draw
P14	0,1	High-Skilled	Amateur	Victory
P15	0,37	High-Skilled	Professional	Lost
P16	-0,31	Low-Skilled	Amateur	Lost
P17	0,01	Medium-Skilled	Professional	Lost
P18	0,41	High-Skilled	Amateur	Victory
P19	0,51	High-Skilled	Professional	Draw
P20	-0,95	Low-Skilled	Amateur	Victory
P21	-0,69	Low-Skilled	Professional	Lost
P22	1,82	High-Skilled	Amateur	Victory
P23	-0,32	Low-Skilled	Professional	Draw
P24	0,51	High-Skilled	Amateur	Victory
P25	0,57	High-Skilled	Professional	Draw
P26	-0,58	Low-Skilled	Amateur	Victory

P27	0,07	High-Skilled	Professional	Lost
P28	-0,12	Medium-Skilled	Amateur	Victory
P29	-0,16	Medium-Skilled	Professional	Lost
P30	-1,02	Low-Skilled	Amateur	Victory
P31	-0,41	Low-Skilled	Professional	Lost
P32	-0,11	Medium-Skilled	Amateur	Victory
P33	-0,64	Low-Skilled	Amateur	Lost
P34	0,33	High-Skilled	Professional	Draw
P35	-0,16	Medium-Skilled	Professional	Lost
P36	-1,36	Low-Skilled	Amateur	Lost
P37	-0,44	Low-Skilled	Amateur	Draw
P38	1,23	High-Skilled	Professional	Victory
P39	0,24	High-Skilled	Professional	Draw
P40	0,41	High-Skilled	Amateur	Victory
P41	0,89	High-Skilled	Professional	Lost

Table 16 - Game Experience Questionnaire - Components vs Skill Groups

Skill Group zScores		GEQ_Competence	GEQ_Immersion	GEQ_Flow	GEQ_Tension	GEQ_Challenge	GEQ_NegativeAffect	GEQ_PositiveAffect
Low Skilled	Mean	2,6765	3,4412	3,0000	2,7941	3,7059	1,8235	2,9118
	N	17	17	17	17	17	17	17
	Std. Deviation	,86496	,78824	,77055	,90241	,58787	,95101	,95583
High Skilled	Mean	3,6111	3,6389	3,6111	2,6667	3,2778	1,8611	3,5278
	N	18	18	18	18	18	18	18
	Std. Deviation	,97853	,61371	,94799	1,09813	1,07406	,85415	,91511
Total	Mean	3,1571	3,5429	3,3143	2,7286	3,4857	1,8429	3,2286
	N	35	35	35	35	35	35	35
	Std. Deviation	1,02736	,70054	,90818	,99516	,88688	,88924	,97274

Anova Test

		Sum of Squares	df	Mean Square	F	Sig.
GEQ_Competence	Between Groups	7,637	1	7,637	8,922	,005
	Within Groups	28,248	33	,856		

	Total	35,886	34			
GEQ_Immersion	Between Groups	,342	1	,342	,690	,412
	Within Groups	16,344	33	,495		
	Total	16,686	34			
GEQ_Flow	Between Groups	3,265	1	3,265	4,349	,045
	Within Groups	24,778	33	,751		
	Total	28,043	34			
GEQ_Tension	Between Groups	,142	1	,142	,140	,711
	Within Groups	33,529	33	1,016		
	Total	33,671	34			
GEQ_Challenge	Between Groups	1,602	1	1,602	2,103	,156
	Within Groups	25,141	33	,762		
	Total	26,743	34			
GEQ_NegativeAffect	Between Groups	,012	1	,012	,015	,903
	Within Groups	26,873	33	,814		
	Total	26,886	34			
GEQ_PositiveAffect	Between Groups	3,318	1	3,318	3,794	,060
	Within Groups	28,854	33	,874		
	Total	32,171	34			

Table 17 - Game Experience Questionnaire vs Skill vs Difficulty Level

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Skill Group	GEQ_Flow	3,250	2	1,625	2,113	,136
	GEQ_Challenge	3,103	2	1,552	3,665	,036
LevelofDifficulty	GEQ_Flow	1,699	1	1,699	2,210	,146
	GEQ_Challenge	2,133	1	2,133	5,037	,031
Skill Group + LevelofDifficulty	GEQ_Flow	2,344	2	1,172	1,525	,232
	GEQ_Challenge	7,579	2	3,789	8,950	,001
Error	GEQ_Flow	26,909	35	,769		
	GEQ_Challenge	14,819	35	,423		
Total	GEQ_Flow	491,000	41			
	GEQ_Challenge	530,250	41			
Corrected Total	GEQ_Flow	33,220	40			
	GEQ_Challenge	28,000	40			

a. R Squared = ,190 (Adjusted R Squared = ,074)

b. R Squared = ,471 (Adjusted R Squared = ,395)

Table 18 - Self Assessment Manikin (SAM) scale results

Arousal (3rd)

Descriptives

Skill Group			Statistic	Std. Error
Low-Skilled	**Mean**		**5,18**	,487
	95% Confidence Interval for Mean	Lower Bound	4,14	
		Upper Bound	6,21	
	5% Trimmed Mean		5,25	
	Median		5,00	
	Variance		4,029	
	Std. Deviation		2,007	
	Minimum		1	
	Maximum		8	
High-Skilled	**Mean**		**4,67**	,560
	95% Confidence Interval for Mean	Lower Bound	3,48	
		Upper Bound	5,85	
	5% Trimmed Mean		4,57	
	Median		5,00	
	Variance		5,647	
	Std. Deviation		2,376	
	Minimum		2	
	Maximum		9	

Mood (3rd)

Descriptives

Skill Group			Statistic	Std. Error
Low-Skilled	**Mean**		**5,82**	,346
	95% Confidence Interval for Mean	Lower Bound	5,09	

		Upper Bound	6,56	
	5% Trimmed Mean		5,86	
	Median		6,00	
	Variance		2,029	
	Std. Deviation		1,425	
	Minimum		3	
	Maximum		8	
High-Skilled	**Mean**		**6,22**	,384
	95% Confidence Interval for Mean	Lower Bound	5,41	
		Upper Bound	7,03	
	5% Trimmed Mean		6,30	
	Median		6,00	
	Variance		2,654	
	Std. Deviation		1,629	
	Minimum		3	
	Maximum		8	

Dominance (3rd)

Descriptives

Skilll Group			Statistic	Std. Error
Low-Skilled	**Mean**		**5,41**	,529
	95% Confidence Interval for Mean	Lower Bound	4,29	
		Upper Bound	6,53	
	5% Trimmed Mean		5,40	
	Median		5,00	
	Variance		4,757	
	Std. Deviation		2,181	

	Minimum		2	
	Maximum		9	
High-Skilled	**Mean**		**6,61**	,486
	95% Confidence Interval for Mean	Lower Bound	5,59	
		Upper Bound	7,64	
	5% Trimmed Mean		6,73	
	Median		7,50	
	Variance		4,252	
	Std. Deviation		2,062	
	Minimum		2	
	Maximum		9	

Table 19 - Correlation Pupil Dilation (Left vs. Right) vs. EDA sum of amplitudes.

		Left Eye pupil diameter (mean)	Right Eye Pupil Diameter (Mean)	Sum of amplitudes in mS
Left Eye pupil diameter (mean)	Pearson Correlation	1	,781**	-,039
	Sig. (2-tailed)		,000	,845
	N	35	35	28
Right Eye Pupil Diameter (Mean)	Pearson Correlation	,781**	1	-,167
	Sig. (2-tailed)	,000		,397
	N	35	35	28
Sum of amplitudes in mS	Pearson Correlation	-,039	-,167	1
	Sig. (2-tailed)	,845	,397	
	N	28	28	28

**. Correlation is significant at the 0.01 level (2-tailed).

Table 20 - Pupil dilation vs. Skill group

Group Statistics

	Skill Level	N	Mean	Std. Deviation	Std. Error Mean
Left Eye pupil diameter (mean)	Low	17	4,4071	,57601	,13970
	High	18	4,3372	,40256	,09488
Right Eye Pupil Diameter (Mean)	Low	17	4,3541	,55044	,13350
	High	18	4,4728	,42279	,09965

Independent Samples Test

		Levene's Test for Equality of Variances	
		F	Sig.
Left Eye pupil diameter (mean)	Equal variances assumed	1,099	,302
	Equal variances not assumed		
Right Eye Pupil Diameter (Mean)	Equal variances assumed	2,074	,159
	Equal variances not assumed		

Table 21 - EDA sum of amplitude vs. Skill group.

Group Statistics

	Skill Groups	N	Mean	Std. Deviation	Std. Error Mean
Sum of amplitudes in mS	Non-Skilled	13	,38292	,358593	,099456
	Skilled	15	,16527	,153820	,039716

Independent Samples Test

		Levene's Test for Equality of Variances	
		F	Sig.
Sum of amplitudes in mS	Equal variances assumed	8,462	,007

Table 22 - Correlation Minimap (FC,FD,TFD)

Correlations

		FD_Minimap_N	FD_Minimap_Mean	TFD_Minimap_Sum
FD_Minimap_N	Pearson Correlation	1	,056	1,000**
	Sig. (2-tailed)		,727	,000
	N	41	41	41
FD_Minimap_Mean	Pearson Correlation	,056	1	,079
	Sig. (2-tailed)	,727		,625
	N	41	41	41
TFD_Minimap_Sum	Pearson Correlation	1,000**	,079	1
	Sig. (2-tailed)	,000	,625	
	N	41	41	41

**. Correlation is significant at the 0.01 level (2-tailed).

Table 23 - Correlation penalty kicking strategy (FC,FD,TFD)

Correlations

		FC_GoalKeeper_N_sum	FD_GoalKeeper_Mean_mean_1	TFD_GoalKeeper_Sum_sum
FC_GoalKeeper_N_sum	Pearson Correlation	1	,417**	,784**
	Sig. (2-tailed)		,007	,000
	N	41	41	41
FD_GoalKeeper_Mean_mean_1	Pearson Correlation	,417**	1	,502**
	Sig. (2-tailed)	,007		,001
	N	41	41	41
TFD_GoalKeeper_Sum_sum	Pearson Correlation	,784**	,502**	1
	Sig. (2-tailed)	,000	,001	
	N	41	41	41

**. Correlation is significant at the 0.01 level (2-tailed).

Table 24 - Goalkeeper strategy vs. Success

Group Statistics

	Penalty_Strategy	N	Mean	Std. Deviation	Std. Error Mean
Success	Goalkeeper Independent Strategy	22	2,82	1,680	,358
	No strategy	17	3,35	,931	,226

Independent Samples Test

		Levene's Test for Equality of Variances	
		F	Sig.
Success	Equal variances assumed	4,878	,033

Table 25 - Brand Recognitions.

Brand Placement

N	Valid	41
	Missing	0
Mean		1,93
Std. Deviation		,755
Variance		,570

BrandPlacement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	13	31,7	31,7	31,7
	No	18	43,9	43,9	75,6
	Not sure	10	24,4	24,4	100,0
	Total	41	100,0	100,0	

Table 26 - Position towards brand placement.

What's your position towards brand placement in Fifa?

N	Valid	41
	Missing	0
Mean		1,73
Std. Deviation		,807
Variance		,651

What's your position towards brand placement in FIFA?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Positive	17	41,5	41,5	41,5
	Neutral	21	51,2	51,2	92,7
	Not sure.	3	7,3	7,3	100,0
	Total	41	100,0	100,0	

Table 27 - Goal net brand placement recognition.

Have you noticed the brand placement in the goal net, while playing the penalty challenge?

N	Valid	37
	Missing	4
Mean		1,76
Std. Deviation		,435
Variance		,189

Have you noticed the brand placement in the goal net, while playing the penalty challenge?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	9	22,0	24,3	24,3
	No	28	68,3	75,7	100,0
	Total	37	90,2	100,0	
Missing	-77	4	9,8		
Total		41	100,0		

Table 28 - Hypothesis results summary

RQ	Hypothesis	Description	Status
1	**1**	Participants with high degree of gaming skills will have higher values measured in the competence, positive affect and immersion components of the iGEQ than the participants with low degree of gaming skills	Rejected
1	**2**	Participants with a high degree of gaming skills playing in the professional level and participants with low degree of skills playing amateur level will have higher values measured in the flow and challenge components of the iGEQ than the rest of the participants	Rejected
1	**3**	Participants in the high skill group will have more positive results in the dominance and mood variable of the SAM scale than the participants located in the low skill group	Rejected
1	**4**	Pupil dilation measurements correlate positively with EDA measurements	Rejected
1	**5**	Participants placed in different skill groups will produce different measurements (pupil dilation/EDA).	Rejected
1	**6**	Higher skilled players will have more fixations in the minimap.	Rejected
2	**1**	Participants that declared to have a goalkeeper dependent penalty kicking strategy show a gazing behavior that is more focused on the goalkeeper than gamers without such strategy	Not enough data
2	**2**	Participants that declared to use a goalkeeper independent strathantegy are more successful than participants without such strategy	Rejected
3	**1**	The number of participants that recognize and remember the brand placement will be superior to 50% of the total number of participants	Rejected

Table 29 - In-game Experience Questionnaire (iGEQ)

Please indicate how you felt while playing the game for each of the items,
on the following scale:

not at all	slightly	moderately	fairly	extremely
0	1	2	3	4
< >	< >	< >	< >	< >

1	I was interested in the game's story	GEQ Core – 3
2	I felt successful	GEQ Core – 19
3	I felt bored	GEQ Core – 18
4	I found it impressive	GEQ Core – 30
5	I forgot everything around me	GEQ Core – 15
6	I felt frustrated	GEQ Core – 32
7	I found it tiresome	GEQ Core – 11
8	I felt irritable	GEQ Core – 27
9	I felt skilful	GEQ Core – 2
10	I felt completely absorbed	GEQ Core – 5
11	I felt content	GEQ Core – 1
12	I felt challenged	GEQ Core – 29
13	I felt stimulated	GEQ Core – 26
14	I felt good	GEQ Core – 16